(2)

FINAL

US Army Corps of Engineers

Toxic and Hazardous Materials Agency

Delivery Order 9
Enhanced Preliminary Assessment

WOODBRIDGE RESEARCH FACILITY, VIRGINIA

Contract Number DAAA15-90-D-0009

March 1992

Prepared for:

U.S. ARMY TOXIC AND
HAZARDOUS MATERIALS AGENCY
Aberdeen Proving Ground
Maryland 21010-5401

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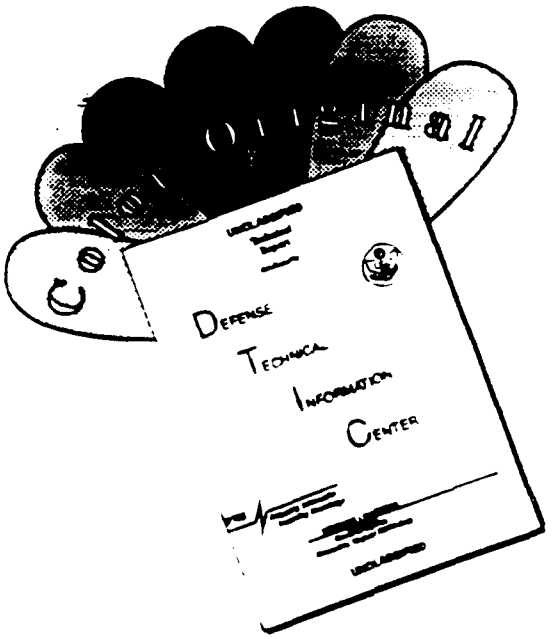

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ENHANCED PRELIMINARY ASSESSMENT

WOODBRIDGE RESEARCH FACILITY
VIRGINIA

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USATHAMA DELIVERY ORDER 9

W.O. 2281-11-09-0002

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	March 1992	Final December 1991 - March 1992

4. TITLE AND SUBTITLE
Enhanced Preliminary Assessment
Woodbridge Research Facility
Woodbridge, Virginia

5. FUNDING NUMBERS
Contract No. DAAA15-90-D-0009 Delivery Order 9

6. AUTHOR(S)
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
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8. PERFORMING ORGANIZATION REPORT NUMBER
2281-11-09-0002

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
USATHAMA
ATTN: CETHA - BC - A
Aberdeen Proving Ground, MD 21010-5401

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
CETHA - BC - CR - 92010

11. SUPPLEMENTARY NOTES
Report is contained in one volume

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Distribution Unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

An enhanced preliminary assessment was conducted at Woodbridge Research Facility (WRF) in Woodbridge,Virginia. WRF is a 579-acre facility located 22 miles southeast of Washington, D.C. It is operated by Harry Diamond Laboratory (HDL) at Adelphi, Maryland for the U.S. Army Laboratory Command. Its mission is to support HDL in a variety of programs involving nuclear weapons effects and Army systems survivability. Based on information obtained during and subsequent to a site visit (18 through 20 September 1991), 27 areas requiring environmental evaluation (AREE) were identified, including landfills, a pistol range, oil-contaminated areas, waste handling areas, storage areas, test areas, underground storage tanks, transformers, oil/water separators, asbestos, drainage ditches and spill areas. This report presents a summary of findings for each AREE and recommendations for further action.

14. SUBJECT TERMS
Woodbridge Research Facility, Base Closure Program, Areas Requiring Environmental Evaluation (AREE's), Human Receptors, Environmental Receptors, Sampling Assessment

15. NUMBER OF PAGES
195 pages

16. PRICE CODE

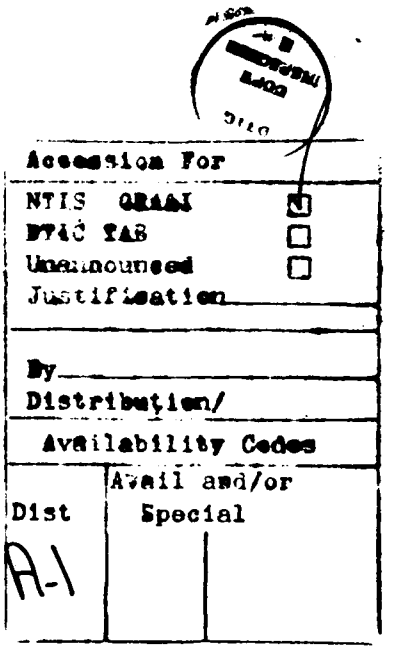
17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	SAR

DISCLAIMER

This Enhanced Preliminary Assessment report is based primarily on the environmental conditions observed at Woodbridge Research Facility, Woodbridge, Virginia, between 18 and 20 September 1991. Past site conditions and management practices were evaluated, based on readily available records and the recollections of people interviewed. Every effort was made, within the scope of the task, to interview all identified site personnel, especially those personnel with a historical perspective of site operations.

No environmental sampling was conducted as part of the assessment. The findings and recommendations for further action are based on Roy F. Weston, Inc.'s experience and technical judgment, as well as current regulatory agency requirements. Future regulations as well as any modifications to current statutes may affect the compliance status of this site.

Roy F. Weston, Inc. does not warrant or guarantee that the property is suitable for any particular purpose or certify any areas of the property as "clean". A more thorough investigation, including intrusive sampling and analyses for specific hazardous materials, is recommended prior to reporting this property as excess.



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LIST OF ACRONYMS AND ABBREVIATIONS

ACM	Asbestos-containing material
AAFES	Army and Air Force Exchange Service
AEHA	U.S. Army Environmental Hygiene Agency
AMC	U.S. Army Materiel Command
AREE	Area requiring environmental evaluation
AST	Aboveground storage tank
ATS	Army Transmitting Station
bgs	Below ground surface
BNA	TCL base-neutral and acid extractable compounds
BTXE	Benzene, toluene, xylene, ethylbenzene
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CONUS	U.S. Army Continental United States
DA	Department of the Army
DARCOM	U.S. Army Materiel Development and Readiness Command
DCE	1,2-dichloroethylene
DEH	Department of Engineering and Housing
DNA	Defense Nuclear Agency
DOD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
EMP	Electromagnetic pulse
EPA	U.S. Environmental Protection Agency

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

EPIC	Environmental Photographic Interpretation Center
ERADCOM	U.S. Army Electronics Research and Development Command
FFIS	Federal Facility Information System
FORSCOM	U.S. Army Forces Command
FS	Feasibility Study
FWS	Fish and Wildlife Service
GCFID	Gas Chromatogram Flame Ionization Detector
gpd	Gallons per day
HC	Hydrocarbons
HDL	Harry Diamond Laboratories
IRP	U.S. Army Installation Restoration Program
ISSA	Inter-Service Support Agreement
LABCOM	U.S. Army Laboratory Command
LUST	Leaking underground storage tank
MERDC	U.S. Army Mobility Equipment Research and Development Center
MDEP	Massachusetts Department of Environmental Protection
MEK	Methyl ethyl ketone
mgd	Million gallons per day
MSL	Mean sea level
NA	Not Applicable
NED	New England Division, U.S. Army Corps of Engineers
NPDES	National Pollutant Discharge Elimination System

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

NPL	National Priorities List
NRC	Nuclear Regulatory Commission
NRMP	National Resources Management Plan
NWI	National Wetlands Inventory
PA	Enhanced Preliminary Assessment
PA/SI	Preliminary Assessment/Site Investigation
PCB	Polychlorinated biphenyls
PCE	Perchloroethylene or tetrachloroethylene
PMCIE	Program Manager for Clothing and Individual Equipment
POL	Petroleum, oil, and lubricants
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
STP	Sewage treatment plant
SWMU	Solid waste management unit
TAL	Target Analyte List
TASC	Training and Audiovisual Services Center
TCA	1,1,-trichloroethane
TCE	Trichloroethylene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total organic carbons
TPH	Total petroleum hydrocarbons

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

TRADOC	U.S. Army Training and Doctrine Command
TSS	Total suspended solids
USACE	U.S. Army Corps of Engineers
USAECFB	U.S. Army Engineer Center and Fort Belvoir
USAEHA	See AEHA
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USGS	U.S. Geological Survey
UST	Underground storage tank
UXO	Unexploded ordnance
VOC	TCL volatile organic compounds
VDWM	Virginia Department of Waste Management
VWCB	Virginia Water Control Board
WESTON	Roy F. Weston, Inc.
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

BACKGROUND AND OBJECTIVES

This enhanced preliminary assessment (PA) report has been prepared by Roy F. Weston, Inc. (WESTON) at the request of the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) pursuant to Contract DAAA15-90-D-0009, Delivery Order 9. The purpose of this enhanced PA report is to document the existing conditions at the Woodbridge Research Facility (WRF), Virginia and to provide recommendations for further action.

The objectives of the PA include:

- Identifying and characterizing all areas requiring environmental evaluation (AREEs).
- Identifying property areas or AREEs that may require a site investigation.
- Identifying AREEs or areas of environmental contamination that may require immediate remedial action.
- Identifying other actions that may be necessary to address and resolve all identified environmental problems.
- Identifying other environmental concerns that may present impediments to the expeditious transfer of this property.
- Identifying to the extent possible parcels of land that can be transferred without further investigation or remediation.

Information contained in this enhanced PA report was obtained through:

- Visual inspection of the facility.
- Review of available Army documentation.
- Review of related regulatory agency files at the State and Federal levels.
- Interviews with current employees at WRF (Appendix H).

Woodbridge Research Facility is a 579-acre government-owned facility located 22 miles southeast of Washington, DC. It is operated by Harry Diamond Laboratories (HDL) at Adelphi, Maryland for the U.S. Army Laboratory Command. Its mission is to support HDL in a variety of programs involving nuclear weapons effects and army systems survivability.

Principal activities at WRF include electromagnetic effects testing, other research and development, administration, and support. Support includes facilities and vehicle maintenance. No nuclear reactive substances were reported used at WRF; electromagnetic pulse generation, used in tests, was produced electrically.

The AREEs have been grouped by the following categories:

- Landfills
- Pistol Range
- Oil-Contaminated Areas
- Maintenance Shop
- Waste Handling Areas
- Storage Areas
- Test Areas
- Underground Storage Tanks
- Transformers
- Oil/Water Separators
- Asbestos
- Drainage Ditch
- Spill Area

HUMAN AND ENVIRONMENTAL RECEPTORS

The following summarizes the routes of human and environmental exposure from the types of releases identified at the AREEs:

- Groundwater flow at WRF follows topography towards Marumsco Creek and Occoquan Bay. AREEs have been identified that may contribute to groundwater contamination (such as drainage ditches, underground storage tanks (USTs), landfills, and oil spills). WRF is not dependent upon this source for its water requirements. Groundwater discharge to the stream flow can be expected during at least part of the year.

- Surface water from WRF drains into Marumsco Creek and Occoquan Bay. This drainage system provides habitat for aquatic wildlife, which are consumed in part by wildlife predators, domestic animals, and humans. AREEs have been identified that may contribute to surface water contamination (such as overland flow over parking, maintenance, and outdoor storage areas). In addition, sediments produced from erosion of contaminated surface soil are a potential source of contamination to aquatic organisms and to off-site surface water, either through leaching within effluent streams or resuspension.

- Contaminated surface/subsurface soils are potential sources of inhalation or direct contact exposure risk to personnel working in or around them. These soils could be contaminated with PCB and metals associated with storage, treatment, and disposal sites. Subsurface soils also could be contaminated with petroleum-based fuels and solvents from leaking USTs. These contaminants may be mobilized through erosion and sedimentation or carried to the aquifer.

- Possible releases to the air generally come from four heating boilers and several propane heaters in portable trailers on WRF. Other possible

releases identified include airborne explosives from the production areas and asbestos from buildings containing asbestos-containing materials.

CONCLUSIONS AND RECOMMENDATIONS

Table ES-1 presents a summary of findings for each AREE and the recommended activity, if any. Figure ES-1 presents sampling locations and recommendation information for the AREEs. No conditions that present an imminent threat to human health were observed on the extensive property. However, possible exposure pathways are represented by human consumption of fish and game on the facility. Exposure to contamination is generally low due to restricted access and lack of use of surface or groundwater at WRF or downstream of WRF.

Table ES-1

AREEs Identified at Woodbridge and Recommendations for Further Action

AREE No.	Description	Summary of Findings	Concern	Recommended Activity	Analyses
1	Landfill No. 1	Landfill contains metal, wire, concrete, wood, rubber tires, possible electrical capacitors. Covered with soil. Operated 1950s - 1973.	Metals, PCBs, Petroleum products, Asbestos.	Sample existing wells. Sample surface debris.	TAL Metals, PCBss, TPH, VOC, BNA, Asbestos.
2	Landfill No. 2	Landfill contained metal debris, wire, wood, misc. refuse, capacitors and transformers containing PCBs. Capped with soil in 1973. Excavated in 1984. Contaminated material taken to H.M. Landfill.	PCBs, metals, petroleum products.	Sample existing wells. Sample sediment and surface water in wetlands area.	TAL Metals, PCBss, TPH, VOC, BNA.
3	Landfill No. 3	Landfill contains lead-containing wire, paper, plastic, wood. Covered with soil in 1973.	Metals, PCBs, petroleum products.	Install three soil boring/ monitoring wells; soil and GW sampling.	TAL Metals, PCBss, TPH, VOC, BNA.
4	Landfill No. 4	Landfill contains wire, trash, empty oil drums. Covered with soil in 1973. Operated 1950s - 1973.	Metals, PCBs, petroleum products.	Install three soil boring/ monitoring wells; soil and GW sampling.	TAL Metals, PCBss, TPH, VOC, BNA.
5	Landfill No. 5	Landfill contains metal debris. Was covered before 1970.	Metals, PCBs, petroleum products.	Install two soil boring/monitoring wells; soil and GW sampling.	TAL Metals, PCBs, TPH, VOC, BNA.
6-A	Potential Landfill	Aerial photos indicate disturbance in 1960s and 1970s.	Metals, PCBs, petroleum products.	Install three soil boring/ monitoring wells; soil and GW sampling.	TAL Metals, PCBss, TPH, VOC, BNA.
6-B	Potential Landfill	Aerial photos indicate soil disturbance in 1960s and 1970s.	Metals, PCBs, petroleum products.	Install one soil boring/monitoring well; soil and GW sampling.	TAL Metals, PCBs, TPH, VOC, BNA.
7	Pistol Range	Rounds fired into soil bank. Covered with soil in 1982.	Lead.	Two soil borings 0 to 4 feet in bank and two soil borings 0-4 feet in firing-line area; visually inspect for rounds.	None.
8	UST Leaks and Spills	Area contained three 10,000 gallon USTs, which were removed after leaking. Several major soil spills during UST filling and oil transfers. Oil leaking into pit in nearby maintenance shop.	Petroleum Products.	Install three soil boring/ monitoring wells; soil and GW sampling. Sample sediment and liquid in condensate return pit in maintenance shop.	TPH.

Table ES-1

AREEs Identified at Woodbridge and Recommendations for Further Action (continued)

AREE No.	Description	Summary of Findings	Concern	Recommended Activity	Analyses
9	Salt in Soil Test Area	Calcium chloride mixed in soil for test at several locations. Salt mixture was removed in one case and sent to Ft. Belvoir.	Calcium chloride.	None.	None.
10	Maintenance Shop (Bldg. 202)	Vehicle maintenance Bldg. Has no drains to the outside.	Petroleum products, VOC, BNA.	None.	None.
11	Oil/Water Separator	Waste oils from motor pool emptied into drains which ran to O/W separator. Water discharged to grounds. Also vehicle Wash Rack drained to O/W separate Wash Rack drain plugged in 1990.	Petroleum products, VOC, BNA.	Inspect tank for leaks, if leaks are found, install soil boring/monitoring well; sample outfall: soil boring 0-4 feet; sample sediment in bottom of tank.	TPH, VOC, BNA.
12	Drum Storage Area	Waste drums stored on pavement north of maintenance shop contain waste oil, paints, cleaning solvents, antifreeze, brake fluid are sent to Adelphi periodically.	Petroleum products, VOC,BNA.	Two borings in asphalt or at edge of pavement; sample at 2-3 feet.	TPH, VOC, BNA.
13	Acid Neutralization Tank	UST connected to drain in battery storage room in Bldg. 211.	Acid, metals.	Inspect tank for leaks. Soil boring to 2 feet below tank. If pH < 6, take soil sample for analysis for metals.	pH.
14	Oil/Water Separator (Bldg. 211)	UST connected to drain in work area in Bldg. 211. Water drains to field east of bldg.	Petroleum products, VOC, BNA.	Inspect tank for leaks. Sample outfall; soil boring 0-4 feet. Sample sediment in bottom of tank.	TPH, VOC, BNA.
15	Transformer	Pad mounted transformer tested, contains 210 gallons transformer oil, 56% PCBs.	PCBs.	Inspect pad for leaks after transformer removal. If pad is stained, then remove chips and analyze for PCBs.	PCBs test if stained.
16	Asbestos	Old boiler removed but potential for asbestos in floor tiles, mastic, isolated pipe insulation, and fire doors.	Asbestos.	Do certification inspection for asbestos. Sample as necessary.	Asbestos.

Table ES-1

AREEs Identified at Woodbridge and Recommendations for Further Action (continued)

AREE No.	Description	Summary of Findings	Concern	Recommended Activity	Analyses
17	Spill Areas	Hydraulic fluid (oil) was spilled from a crane and a bulldozer at two locations. Remedial action was taken immediately.	Petroleum products.	None.	None.
18	Flammable/Battery Storage (Bldg. 204)	Storage bldg for drums and batteries. Has concrete floor. Current battery storage area has safety shower and drain.	Metals, VOC, BNA.	Dispose of drums. Surface soil sample (0-6") outside doors to rooms, determine where drain goes and sample out fall.	Lead, VOC, BNA.
19	Thermal Battery Storage	Metal container has thermal batteries.	Metals, asbestos.	Dispose of batteries and sample soil beneath containers 0-2 feet.	TAL Metals.
20	Former Incinerator	Metal box was used to burn paper during period 1950s to mid 1970s.	Metals.	Surface soil sample 0-2 feet visually inspect soil to confirm that only paper was burned.	None.
21	Former Storage Area	Site partially covered by present Bldg. 211. Reportedly stored transformers & capacitors in early 1970s.	PCBs, TPH.	Soil boring 0-4 feet in 4 places.	PCBs, TPH.
22	Drainage Ditch	Oil spills may have drained to ditch, contamination may have entered ditch from off-site.	Petroleum products.	Take a sediment sample and a water sample upstream and downstream of inner compound.	TPH.
23	Former Underground Storage Tanks	Six USTs have been removed, four as the result of failing leak tests conducted in 1990 and 1991, and two removed earlier after they were determined to be leaking.	Petroleum products.	Install three monitoring wells at UST near Bldg 203 that was removed in 1986; sample two wells that were installed with new gasoline UST near Bldg 202.	TPH.
24	Existing Underground Storage Tanks	Six USTs, of which two have been leak tested.	Petroleum products.	Continue program to leak test all USTs. Comply with UST regulations.	None.
25	Sewage Injection Area	Sewage sludge injected into ground at depth of 2 feet in 1974.	Metals.	Six soil borings to 3 feet - one sample from each boring.	TAL metals.

Table ES-1

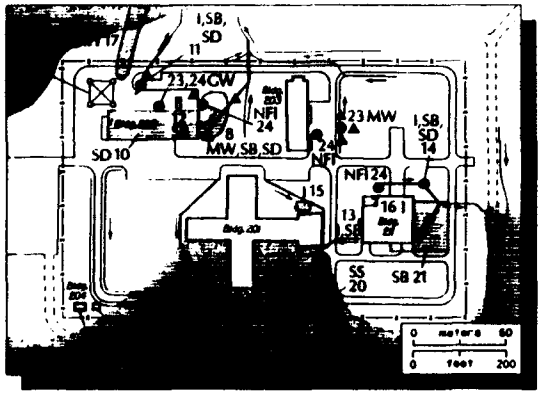
AREEs Identified at Woodbridge and Recommendations for Further Action (continued)

AREE No.	Description	Summary of Findings	Concern	Recommended Activity	Analyses
26	Buried Antifreeze in Hoses	Ethylene glycol in rubber pipes in ground.	Ethylene glycol.	Remove pipes. Install soil borings.	Ethylene glycol by GCFID, direct injection for ethylene glycol.
27	Buried Wire	Metal and plastic wire buried in ground for tests could contain PCBs.	Lead, PCBs.	Remove samples of wire.	PCBs and, if cable is deteriorated, soils for PCBs and Metals.

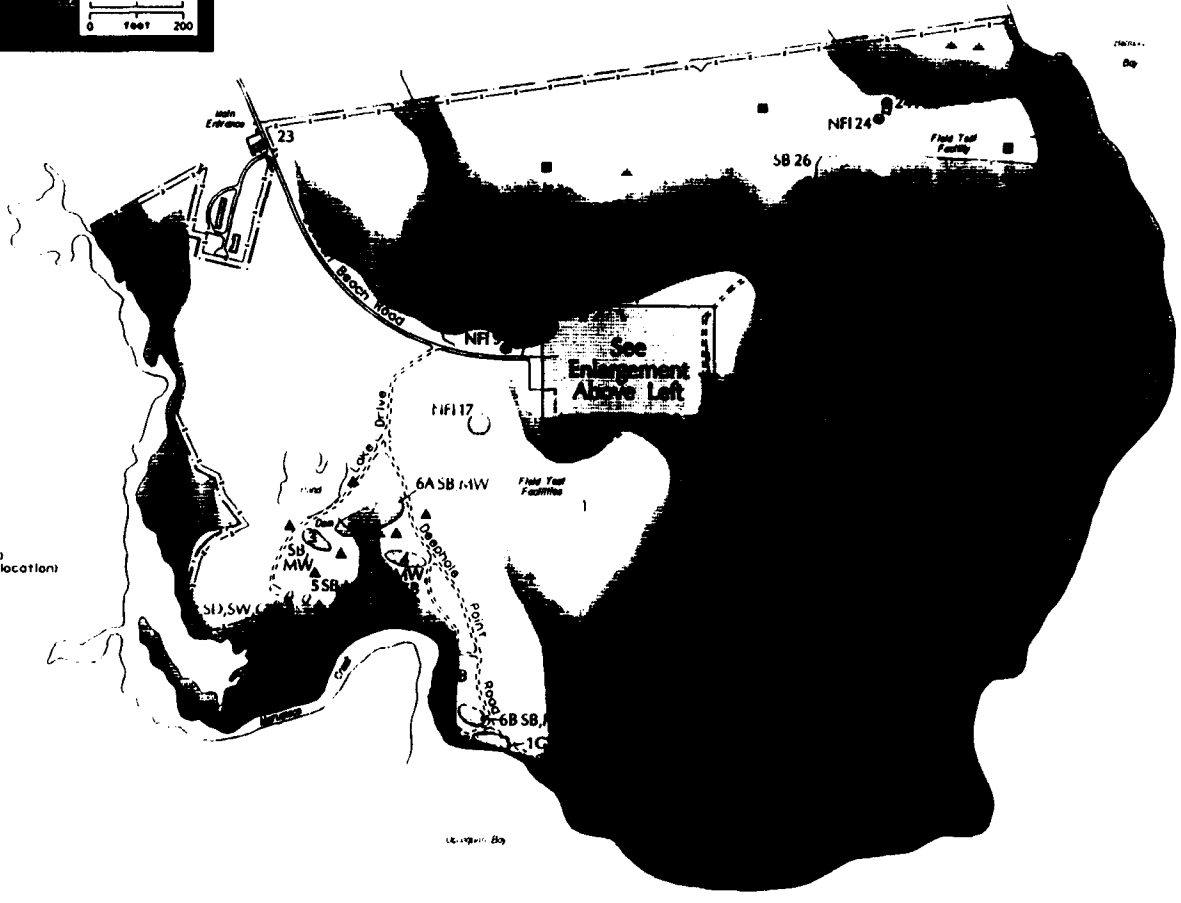
U. S. Army
Base Closure Preliminary Assessment
Woodbridge Research Facility
Woodbridge, VA – December 1991

Figure ES-1
Property Information Composite

Compiled in part from various sources provided by the U.S. Army Toxic and Hazardous Materials Agency



- Installation Boundary
- Hydrography
- Road/Pavement Edge
- Gravel Edge
- Railroad
- Powerline
- Pipeline
- Fence
- Structure



1. Landfill Number 1
2. Landfill Number 2
3. Landfill
4. Landfill
5. Landfill
6. Potential Landfill (2 Locations)
7. Pistol Range
8. UST Leaks and Spills
9. Salt In Soil Test Area
10. Maintenance Shop
11. Oil/Water Separator
12. Drum Storage Area
13. Acid Neutralization Tank
14. Oil/Water Separator
15. Transformer
16. Asbestos In Buildings
17. Oil Spill Areas (2 Locations)
18. Flammable Storage
19. Thermal Battery Storage
20. Former Incinerator
21. Former Storage Area
22. Drainage Ditch
23. Former Underground Storage Tanks
24. Underground Storage Tanks
25. Sewage Spreading Area (not shown throughout northern part of facility)
26. Buried Antifreeze Pipes (approximate location)
27. Buried Wire (throughout facility)
28. Radon (not shown)

- Drainage, Direction Of Flow
- Storm Drain
- 100-Year Flood Plain

GW	Groundwater
I	Inspect Area; Recommendations Based On Findings
MW	Monitoring Well
NFI	No Further Investigation Needed At This Time
SB	Soil Boring
SD	Sediment
SW	Surface Water

- Proposed Soil Boring For Injected Sewage
- Proposed Monitoring Well
- 24 ARLE Number
- ARFE

US Army Corps of Engineers
Toxic and Hazardous Materials Agency

SECTION 1

INTRODUCTION

1.1 BACKGROUND

Roy F. Weston, Inc. (WESTON) has been retained by the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) to prepare Enhanced Preliminary Assessment Reports under the authority of Contract DAAA15-90-D-0009, Task Order 0009. This work is being performed within the scope of the U.S. Army Installation Restoration Program (IRP) Base Closure Division.

The purpose of the PA report is to document the existing conditions at the properties and to provide recommendations. The recommendations will serve as a guide to the U.S. Army in prioritizing the activities required to report these properties as excess.

This report discusses the PA of the Woodbridge Research Facility (WRF), which is located in Woodbridge, Virginia. WESTON conducted a site visit on 18, 19, and 20 September 1991.

1.2 OBJECTIVES

This PA report was prepared using existing information obtained from property records and interviews with current employees familiar with this property. No sampling activities were completed as part of this assessment.

The objectives of the PA include:

- Identifying and characterizing all areas requiring environmental evaluation (AREEs).
- Identifying property areas or AREEs that may require a site investigation.
- Identifying AREEs or areas of environmental contamination that may require immediate remedial action.
- Identifying other actions that may be necessary to address and resolve all identified environmental problems.
- Identifying other environmental concerns that may present impediments to the expeditious transfer of this property.
- Identifying to the extent possible parcels of land that can be transferred without further investigation or remediation.

This report will support the U.S. Army Base Realignment and Closure Environmental Restoration Program.

1.3 PROCEDURES

The information contained in this PA report is based on the following data-gathering activities:

- Visual inspection of the facilities.
- Review of available Army information.
- Review of U.S. Environmental Protection Agency (EPA) Region III files.
- Review of the Virginia Water Control Board files.
- Interviews with current employees familiar with WRF operations.
- Evaluation of aerial photographs.

A survey of drinking water fountains at WRF was conducted by the Army regarding the presence of lead in the water. One fountain was found to have lead concentrations in excess of the 50 ppb concentration limit established by EPA. All other fountains were below the EPA limit (Rock, 1992). There has been no known survey for the presence of lead-based paints on building or equipment surfaces. The time period of construction of portions of the WRF facilities suggests, however, that lead-based paints and lead piping may have been used.

1.4 REPORT FORMAT

This PA report presents an evaluation of the relevant data for WRF.

Section 2 describes the property and provides general environmental information about the site. Section 3 identifies and characterizes all AREEs at WRF related to known and suspected releases to the environment. The potential impacts of these operations on the local environment and human receptors are discussed in Section 4. Section 5 summarizes the findings and conclusions, discusses the quality and reliability of the supporting information, identifies areas requiring further action, and presents recommendations as to how such actions may be accomplished. Section 6 lists the pertinent materials reviewed and the agencies contacted. Photographs taken during the site visit are provided in Section 7. Supporting documentation is provided in Appendices A through H.

SECTION 2

PROPERTY CHARACTERIZATION

2.1 PROPERTY DESCRIPTION AND HISTORY

Woodbridge Research Facility (WRF) occupies approximately 579 acres of land in the town of Woodbridge in Prince William County, Virginia. WRF is the former Strategic Communications Command radio transmitter site for the east coast. The property, originally comprising approximately 642 acres, was transferred to Harry Diamond Laboratories (HDL) in July 1971. In August 1973, 63 acres in the vicinity of Marumsco Creek was transferred to the Department of the Interior, Bureau of Sports, Fisheries, and Wildlife for use as a park and wildlife refuge. Figure 2-1 shows a map of the site location. A property information summary is provided in Table 2-1.

Scientists, engineers, technical, and administrative personnel are employed at WRF in support of HDL in a variety of programs involving nuclear weapons effects and army systems survivability. WRF personnel analyze the performance of weapons and other military system components during simulated nuclear detonation effects. In addition, life cycle management of Army clothing and individual equipment is the mission of the Army Materiel Command (AMC) Program Manager for Clothing and Individual Equipment (PMCIE), a tenant at WRF, which is responsible for overseeing the design, development, testing, procurement, and supply of these items for soldiers (NRMP, 1991).

The history of WRF has been well documented. Historical records of the property dating back to the late 17th century indicate that the Mason family, one of the dominant families in the Woodbridge area, had large land holdings on both sides of the Occoquan, including Mason's Neck (Thunderbird, 1985).

Martin Scarlet, another prominent 17th-century figure in the area, purchased approximately 700 acres including the WRF site in 1657 from Captain Edward Streator and named it Deep Hole Point. The gravestones of Martin Scarlet and his son John still exist on the WRF grounds today (NRMP, 1991).

Following the American Revolution, the economy of the Woodbridge area began a slow decline. Several factors appear to have contributed to this, among them the reduction in soil fertility from continual tobacco crops and the silting-in of harbors due to stripping of surface cover and plowing techniques of the 17th and 18th centuries.

Fisheries, including one on the southern edge of the Woodbridge facility, were important economically and are located on Civil War-era maps (Davis et al., 1978).

The main road crossed Occoquan Creek at the village of Occoquan. This road replaced the earlier one, which crossed by ferry at Colchester. A ferry operated at times between Deep Hole Point and Sandy Point on the end of Mason's Neck. The Deep Hole farm

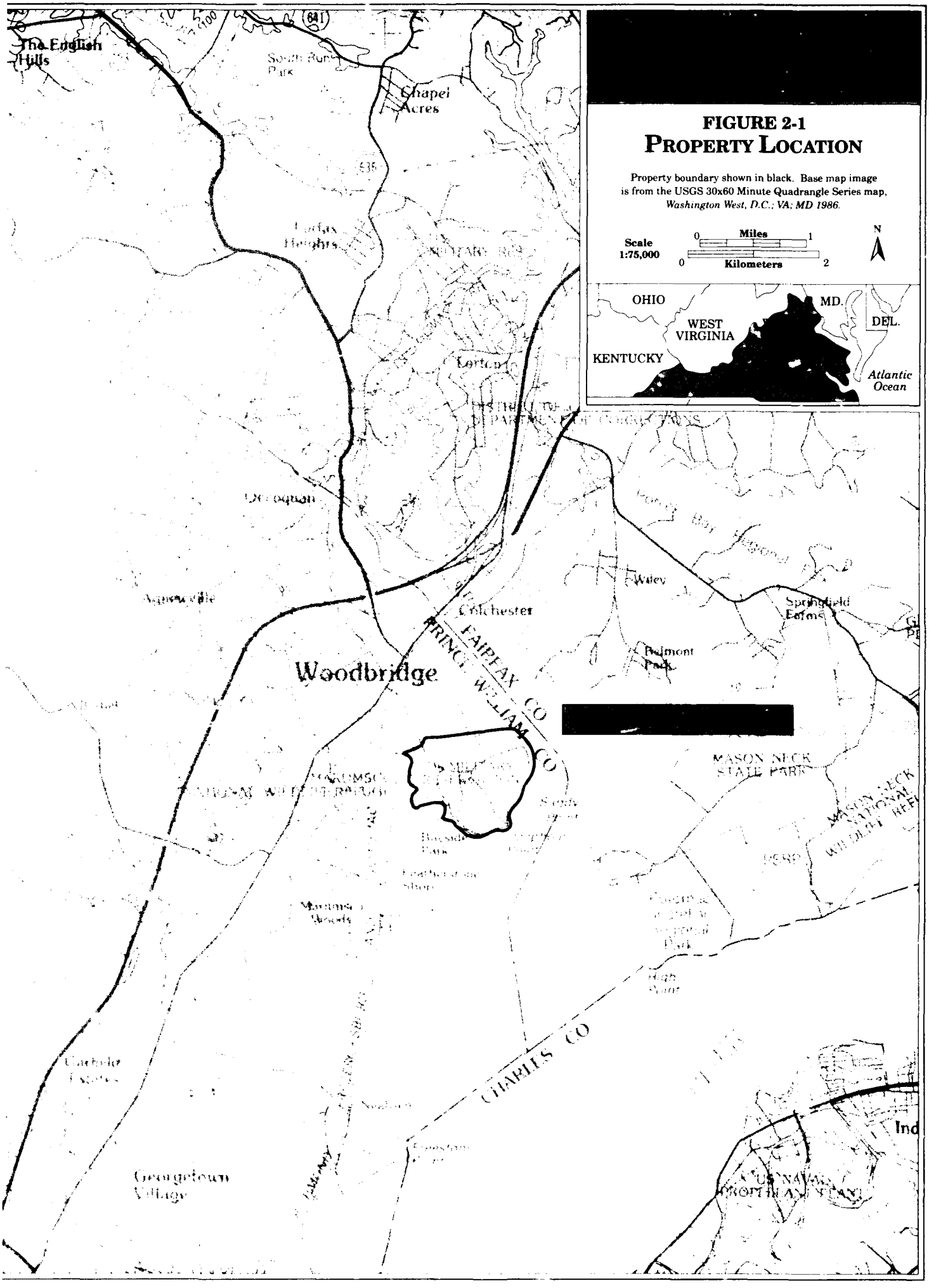

The English Hills
Chapel Acres
Woodbridge
Colchester
Belmont Park
MASON NECK STATE PARK
PRINCE WILLIAM CO
FAIRFAX CO
CHARLES CO
Georgetown Village
Wiley
Springfield Estates
FIGURE 2-1
PROPERTY LOCATION
Property boundary shown in black. Base map image is from the USGS 30x60 Minute Quadrangle Series map, Washington West, D.C.; VA; MD 1986.
Scale 1:75,000
Miles
Kilometers
N
OHIO
MD.
DEL.
WEST VIRGINIA
KENTUCKY
Atlantic Ocean

Table 2-1

Property Information Summary

Name: Woodbridge Research Summary

FFIS Number: VA - 213820981

Property Number: 51185

Command: U.S. Army Laboratory Command

County: Prince William County, Virginia

Property Description: WRF is located 1.5 miles east of Woodbridge, Virginia, a town of about 31,000. The facility is bounded by Occoquan and Belmont Bays to the east and south and residential, commercial, and industrial areas to the north and west.

Installation Coordinates: 38°40'N; 77°17'W

Size: 579 acres

Mission: Support Harry Diamond Labs in Adelphi, Maryland, in investigating nuclear weapons effects and army systems survivability.

Operations: Primary activities are performing electromagnetic effects testing to simulate nuclear detonation effects and miscellaneous testing of military equipment. These activities are supported by administrative and maintenance functions.

and surrounding property was purchased by Colonel John Taylor in 1765 and held for close to a century.

During the Civil War, Confederate batteries were constructed in the vicinity of the Woodbridge Facility. After the Civil War, and until the construction of the Woodbridge Research Facility, the primary land use on the facility appears to have been farming, especially on the northern half of the facility. Farm residences and outbuildings were present, and all the land on this portion of the facility was plowed. Because of the generally low elevation, erosion of the facility was minimal, with the exception of the western edge facing Marumsco Creek, and possibly the borders of a small drainage just north of the present main structures (Thunderbird, 1985).

The fisheries located on the southern shore and the ferry indicated as running from the southeast corner to Sandy Point on Mason Neck would not have caused land disturbance.

In 1908, J. Lindsay Dawson of Fairfax County bought the farm, and the property was subsequently used for cattle raising and fisheries until 1951, when it was purchased by the government. The last remaining structure, the Dawson farmhouse, burned down in 1968. There are building foundations still remaining on the northern portion of the facility (Thunderbird, 1985).

In 1951, the Army acquired the fee-simple title to 648.62 acres of land in Woodbridge, Prince William County, Virginia for use as a military radio station. Later that year, 0.07 acre was purchased, increasing the total to 648.69 acres. In 1952, the site was assigned to the U.S. Army Command and Administrative Communications Agency and designated as the Army Transmitting Station (ATS).

In 1962, ATS was redesignated the U.S. Army Continental United States (CONUS) Regional Communications Command, East Coast Radio Transmitting Station. In 1965, it was placed under the U.S. Army Strategic Communications Command, CONUS. Between July 1969 and July 1970, the station remained inactive; however, at the end of that period, 641.70 acres of the site was transferred to the U.S. Army Materiel Command. The suitability of its environment for electromagnetic pulse (EMP) testing and development led to its reassignment to the U.S. Army Mobility Equipment Research and Development Center (MERDC), Fort Belvoir, Virginia and its redesignation as WRF. Concurrent with these developments, 69.19 acres of WRF land reserved for housing was transferred to Fort Belvoir.

In July 1971, HDL, Adelphi, Maryland acquired 642 acres of land and 49,678 square feet of permanent buildings at the WRF site as part of an Army consolidation effort involving nuclear weapons effects research and test activities. In September 1971, the Electromagnetic Effects Laboratory of Fort Belvoir was physically moved to WRF.

In December 1972, 62.83 acres of WRF land along Marumsco Creek was declared excess and, in 1973, was transferred to the U.S. Department of the Interior for use as a wildlife conservation area. WRF currently covers approximately 580 acres of land.

As a satellite installation of HDL, WRF's mission is to conduct EMP research and testing and, more specifically, to investigate and study the effects of EMP produced by exo-atmospheric nuclear weapons detonation on communications and other military systems (DARCOM, 1979). Testing is accomplished on-site using four pulsers. Items tested at WRF have included the XMZ Track Vehicle, XMI Tank, Lance Missile, miscellaneous classified tanks, pacemakers, hearing aids, and commercial electronics equipment (i.e., TVs, radios, stereos) for the Defense Nuclear Agency (DNA).

2.2 DESCRIPTION OF FACILITIES

This subsection provides a brief overview of the operations and structures. Detailed descriptions of specific operations are provided in Section 3.

WRF contains a Wildlife Sanctuary/Open Space area along the riverfront, three electromagnetic effects testing areas, a research/development and testing area, a central compound for research/development and administration, a recreation area at the northeast corner of the installation, and an open space buffer along the northern boundary of the facility. There are currently 12 buildings and 5 field test installations. No housing facilities are located on the site.

Fuel and other fluids are stored at WRF in both drums and underground storage tanks (USTs), as discussed in Section 3.

Five landfills were operated at the site over the years for disposal of debris. It is suspected that these landfills contained PCB-containing transformers and capacitors.

Wastewater generated at the site consists primarily of sanitary wastewater. The wastewater is currently discharged to the Occoquan Woodbridge Sanitary District. Pretreatment of the wastewater is done only in the acid neutralization tank located at Building 211 (see Subsection 3.5.1). Sewage from the main building complex flows by gravity to a small holding tank in Building 301. It is pumped from there to the municipal sanitary sewer line.

Areas at WRF that may be of environmental concern include the landfills; spill and drainage areas; areas where toxic or hazardous materials and PCBs were used or stored; buried copper and lead wire antennas; and a buried intruder detection system composed of ethylene glycol-filled plastic pipes.

2.3 GENERAL ENVIRONMENTAL INFORMATION

2.3.1 DEMOGRAPHICS AND ADJACENT LAND USE

WRF is located in the easternmost portion of Prince William County, Virginia and has a total area of 579 acres. Prince William County is located in northern Virginia and contains a total land area of 355 square miles. The county's population, according to a 1991 estimate, is 219,033. WRF is located less than 1.5 miles east of downtown Woodbridge and 22 miles southeast of Washington, D.C.

The town of Woodbridge has a population of 30,860 (1991 estimate). U.S. Census Bureau Tract No. 9001.00, which encompasses WRF and the land immediately adjacent to the facility, contains an estimated 1,216 residents (1991). This tract is generally bounded by the RF&P railroad tracks on the west.

There is a diversity of land use and employment types throughout the county. Over 50 percent of the land in the county is zoned for agricultural use, although most of it is located in the western part of the county.

Generally, the land immediately adjacent to WRF is zoned either residential or heavy industrial to the north and residential or agricultural to the west and southwest around Marumsco Creek. More specifically, to the north of the facility and east of Dawson Beach Road lies residential property zoned either R-10 (Suburban residential), R-T (Residential Townhouse), or RM-1 (Residential Multi-family). However, a large plot at the end of Taylor's Point Road, believed to be a private residence, is zoned M-1 (Heavy industrial use) according to the 1988 Prince William County Zoning Map. (Prince William County, 1988)

To the west of Dawson Beach Road lies a heavily industrialized area. In the northwest corner of the facility site are nine military family housing units, administered by the U.S. Army Engineer Center and Fort Belvoir, Fort Belvoir (USAECFB), VA.

To the west, the facility is bounded by Marumsco Creek and the Marumsco National Wildlife Refuge tidal wetlands. West of Marumsco Creek is Veteran's Memorial Park, a recreation area administered by Prince William County.

2.3.2 CLIMATE

The climate at WRF is variable, influenced by Chesapeake Bay and the Atlantic Ocean to the east and the Appalachian Mountains to the west. Under Koeppen classifications, the summers are characterized by maritime-tropical winds from the south and southwest, which bring warm, often humid air to the region. High-pressure systems often stagnate over the area, creating occasional air pollution episodes during the summer. Winter is characterized by cold, dry continental-polar winds from the west and northwest.

The annual mean daily temperature for the area is 57°F. The monthly mean temperatures for the area range from an average high of 90°F in July to an average low of 29°F in January. The recorded high temperature was 106°F in July 1930, and a low of -15°F was recorded in February 1899. The growing season, based on average first and last killing frosts, is from April 15 to October 15 (ESE, 1981).

The average annual precipitation is 38.88 inches. Snowfall averages less than 10 inches per year. The maximum recorded snowfall of 25 inches fell in January 1922 (NRMP, 1991).

Figure 2-2 shows a wind rose for Washington National Airport, which is 22 miles northwest of WRF. The winds are generally out of the south in the summer months and the north to northwest in the winter months. The average windspeed is 7.1 mph. The prevailing southerly flow associated with the Gulf Stream during the summer months often increases the potential for late afternoon/evening thunderstorms, which provide much of the precipitation during this period (LABCOM, 1989).

2.3.3 PHYSIOGRAPHY AND SURFACE WATER

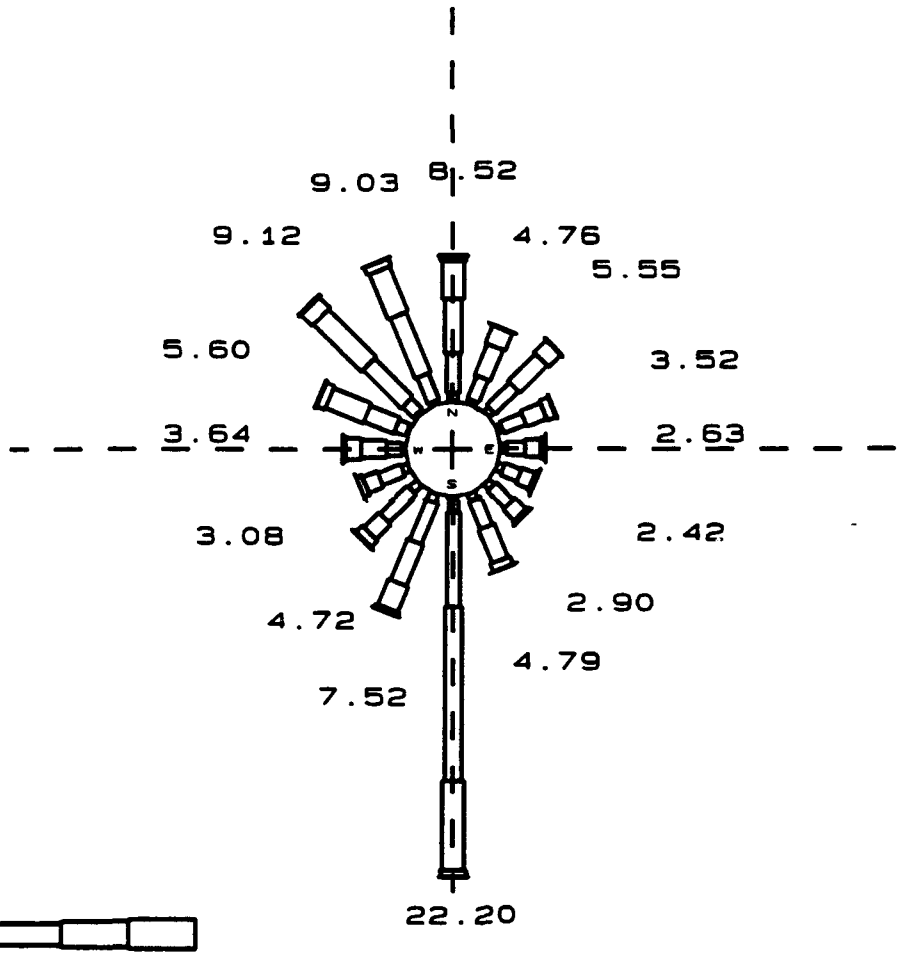
WRF is located on a neck of land at the southern edge of the embayed mouth of the Occoquan River, where it empties to Belmont Bay and Occoquan Bay, which feed the Potomac River and the Chesapeake Bay. Physiographically, the facility lies in the western or inner part of the Coastal Plain Province, less than 5 km to the east of the Piedmont Province. The southern portion of the facility is marsh, underlain by alluvium from Potomac River and Occoquan River terrace deposits, while the northern portion of the facility is situated on a slightly higher, post-Pleistocene terrace of the Potomac.

The facility is located in the drainage basin of the Occoquan Watershed and is composed primarily of terrace and alluvial deposits from this and the ancestral Potomac River. The cobbles and gravels derive originally from the ancestral Potomac and include a variety of cherts, jasper, quartzite, rhyolite, silicified sandstone, and quartz. Tributary streams such as the Occoquan River and Marumsco Creek also carry this material as they cut through the various cobble deposits and quartz float and veins in the adjacent Piedmont. Some larger cobbles and boulders possibly originated from ice rafting mechanisms (Ward, 1991) associated with late Sangamon glaciation.

The primary surface water sources presently affecting WRF are the Occoquan River to the north and Marumsco Creek to the south. The facility is also bisected by an unnamed creek originating from residential and partly industrialized areas to the north. This creek flows around the main compound and is fed by several smaller drainage lines before eventually feeding to Belmont Bay. Several additional drainage courses are also found on the property. Figure 2-3 depicts the surface water drainage patterns and flow directions found at WRF.

Much of the northern third of the facility and a small section of the center of the facility, where the main installation is located, are underlain by deep, well drained soils of the Elsinboro sandy loam (SCS, 1989). The Elsinboro sandy loam is described as "developed from sediments washed from upland soils derived from the weathered products of quartzite, granitic, or micaceous schist rocks." This soil is often underlain by gravels or small cobbles, which can be exposed if the deposits have been eroded. It is the major soil on the facility with agricultural potential, proving good to excellent for most crops. The lower portion of the remaining non-marsh area in the facility is classed with the Marumsco loam (Sinclair, 1991b), a poorly drained soil developed from marine sediments.

WASHINGTON, DC NATIONAL
1985 THROUGH 1990
CALMS INCLUDED

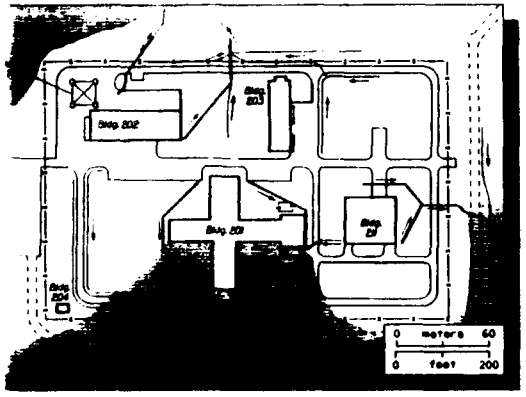


SCALE (KNOTS)

	WIND SPEED (KNOTS) PERCENT OCCURRENCE					
	0-3	3-6	6-10	10-16	16-21	>21
N	0.47	2.36	3.15	2.22	0.29	0.03
NNE	0.27	1.38	1.95	1.10	0.06	0.00
NE	0.35	1.88	2.25	1.01	0.06	0.00
ENE	0.32	1.36	1.26	0.54	0.05	0.00
E	0.33	1.11	0.90	0.26	0.03	0.01
ESE	0.38	1.02	0.82	0.19	0.02	0.00
SE	0.43	1.35	0.92	0.18	0.01	0.00
SSE	0.40	1.78	2.10	0.48	0.02	0.00

	WIND SPEED (KNOTS) PERCENT OCCURRENCE					
	0-3	3-6	6-10	10-16	16-21	>21
S	0.89	5.51	10.20	5.18	0.39	0.03
SSW	0.52	2.54	2.58	1.61	0.24	0.02
SW	0.60	2.33	1.21	0.52	0.05	0.01
WSW	0.38	1.42	0.89	0.36	0.02	0.01
W	0.18	0.90	1.47	0.93	0.15	0.02
WNW	0.10	0.66	1.88	2.36	0.51	0.08
NW	0.15	0.88	3.16	3.93	0.87	0.13
NNW	0.21	1.64	3.80	2.83	0.47	0.07

FIGURE 2-2 WIND ROSE



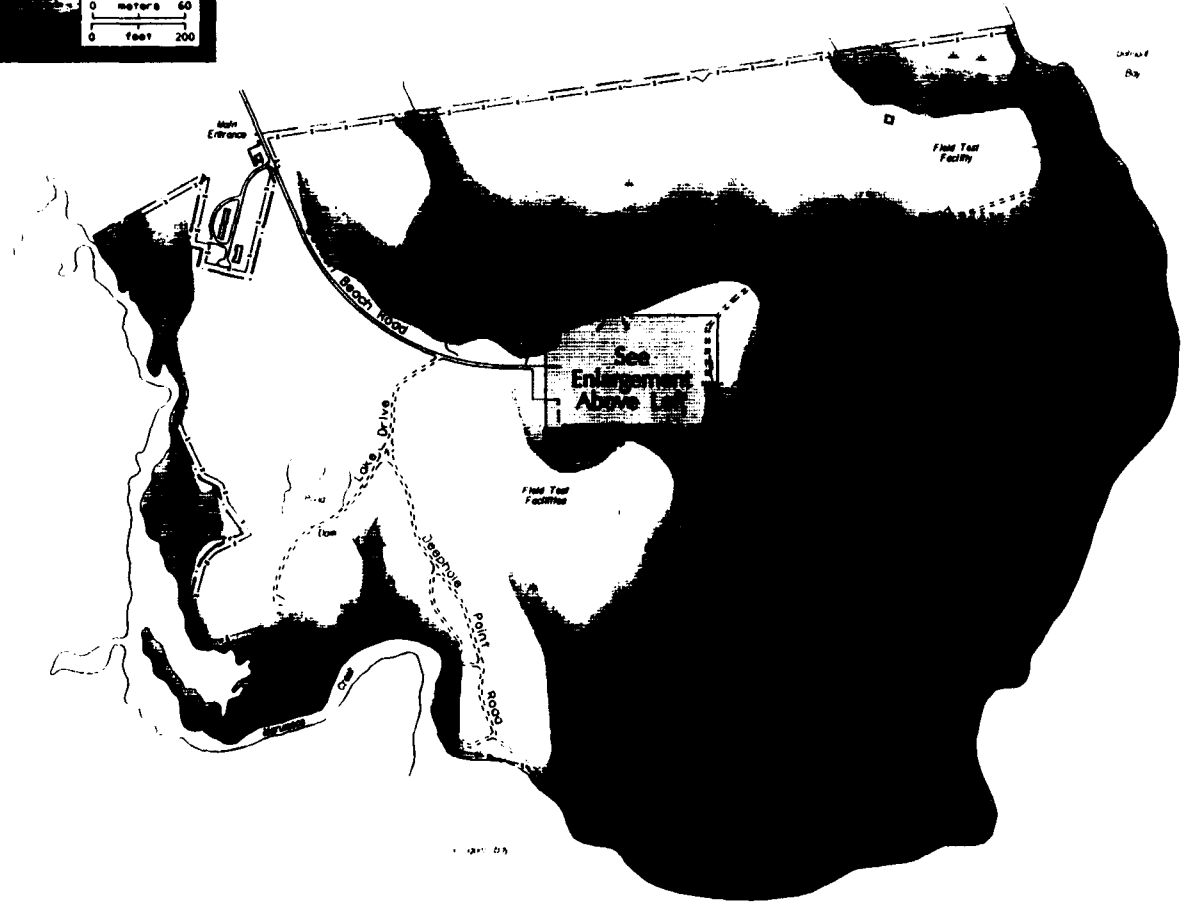
Installation Boundary
Hydrography
Road/Pavement Edge
Gravel Edge
Railroad
Powerline
Pipeline
Fence
Structure

U. S. Army
Base Closure Preliminary Assessment
Woodbridge Research Facility
Woodbridge, VA - December 1991

Figure 2-3
Site Plan Delineating Surface Drainage and Flood Plain Boundaries

Compiled in 1991 from various sources provided by the U.S. Army Toxic and Hazardous Materials Agency

0 meters 200
0 feet 800



Drainage, Direction Of Flow
Storm Drain
100-Year Flood Plain

US Army Corps of Engineers
Toxic and Hazardous Materials Agency

2.3.4 SOILS

According to the USDA Soil Survey for Prince William County issued in August 1989, the general soil association found in the eastern Woodbridge vicinity is the Dumfries-Lunt-Marr soil association. Dumfries soils are on strongly sloping to very steep side slopes. They are well drained and very deep and have a loamy subsoil. Lunt soils are on gently sloping to moderately steep side slopes and are well drained, very deep, and have a loamy subsoil. Marr soils are on strongly sloping to moderately steep slopes, are very deep and well drained, and have a high content of fine sand and very fine sand.

The Dumfries-Lunt-Marr unit is most often located in forests of mixed hardwoods and pines. A few areas within this unit are used for general farm crops, and some acreage is used for residential or industrial development. Its slow permeability, high clay content, slope, and wetness are the main limitations of the unit for farming.

Less abundant units frequently found as part of this soil association are the Featherstone soils at low elevations, inundated by extreme high tides; Marumsco soils on low, nearly level terraces, with a high clay content; Neabsco soils at higher elevations, with a fragipan in the subsoil; Quantico soils, which are clayey, very deep, and well drained; and Codorus and Hatboro soils, moderately well drained to poorly drained soils on floodplains.

For WRF specifically, there are six soil associations presently identified, based on partial mapping of the facility in 1976 and subsequent correlation with the recently published soil survey (Prince William County SCS, 1976; Prince William County, 1991). Soil associations, as correlated by Diane Sinclair of the Prince William County Soil and Conservation District in October 1991, are described below. An interpretation of the mappable units is shown in Figure 2-4. The map interpretation is based on the 1976 mapping information correlated with the new nomenclature set forth in the 1989 Soil Survey of Prince William County (SCS, 1989).

Delanco Series:

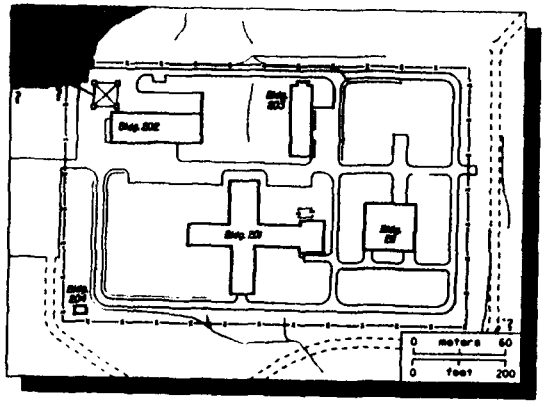
The soils of the Delanco series are very deep and moderately well drained. They formed in alluvial materials on low river terraces on the Piedmont Plateau. The soils are subject to rare flooding. Slopes range from 0 to 4 percent.

Dumfries Series:

The soils of the Dumfries series are very deep and well drained. They formed in feldspathic sandy sediments of the Coastal Plain. The soils are on narrow ridges and side slopes. Slopes range from 7 to 50 percent.

Elsinboro Series:

The soils of the Elsinboro series are very deep and well drained. They formed in sediments dominantly derived from schist, gneiss, and granite of the northern Piedmont



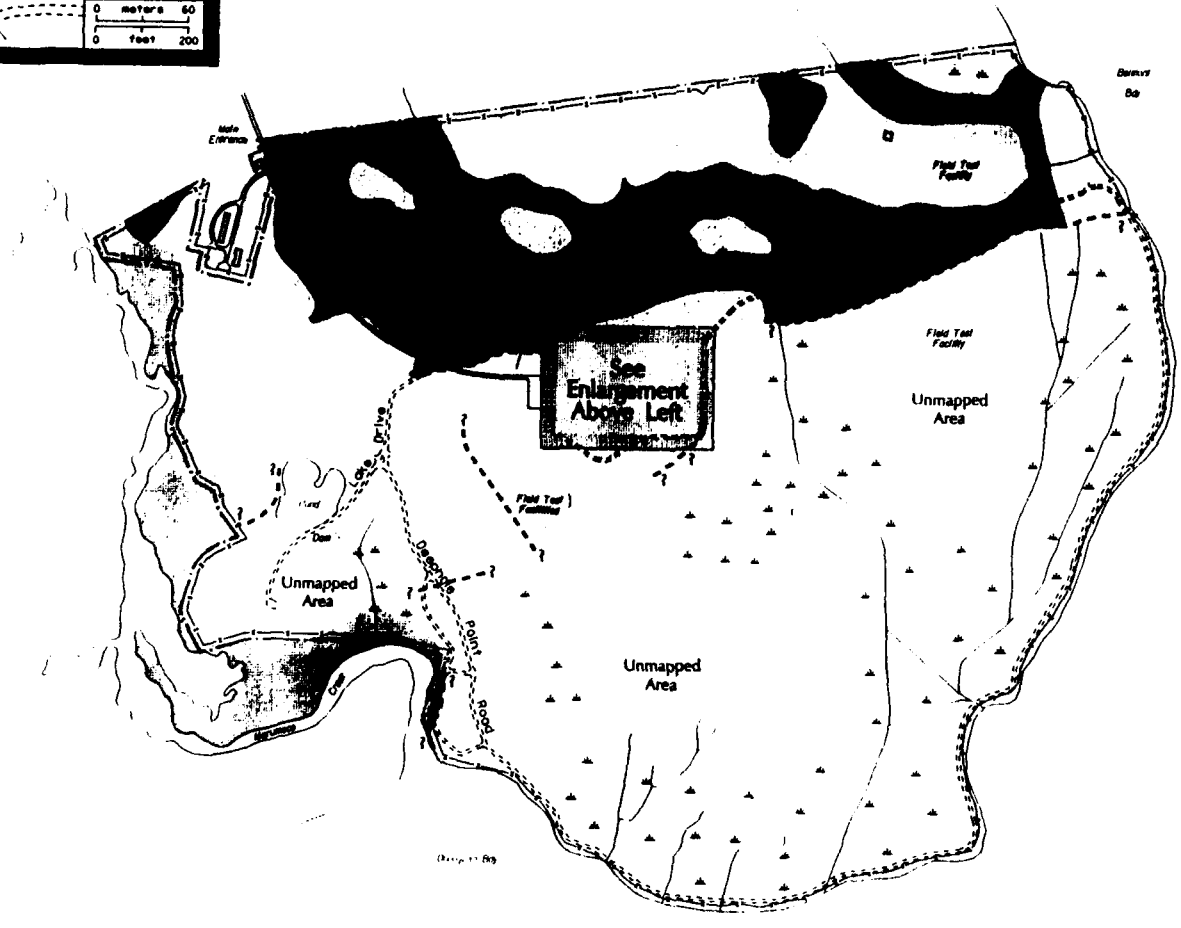
Installation Boundary
Hydrography
Road/Pavement Edge
Gravel Edge
Railroad
Powerline
Pipeline
Fence
Structure

U. S. Army
Base Closure Preliminary Assessment
Woodbridge Research Facility
Woodbridge, VA – December 1991

Figure 2-4
General Soils Map

Compiled in 1991 from various sources provided by the U.S. Army Toxic and Hazardous Materials Agency

N
0 meters 200
0 feet 800



Boundary Uncertain

Delanco Series: Very deep and moderately well drained soils; formed in alluvial materials on low river terraces on Piedmont Plateaus subject to rare flooding; slopes range from 0 to 4 percent

Dumfries Series: Very deep and well drained soils; formed in feldspathic sandy sediments of Coastal Plains on narrow ridges and side slopes; slopes range from 7 to 50 percent

Elsinboro Series: Very deep and well drained soils; formed in sediments dominantly derived from schist, gneiss, and granite of northern Piedmont Plateaus on low stream terraces adjacent to flood plains; rare flooding; slopes range from 2 to 7 percent

Featherstone Series: Very deep and very poorly drained soils; formed in Coastal Plain sediments at an elevation of less than 2 feet; water table is commonly at the surface; most areas are subject to ponding; slopes range from 0 to 1 percent

Marumsco Series: very deep and moderately well drained and somewhat poorly drained soils; formed in stratified marine sediments of low Coastal Plain terraces; in depressional areas; slopes range from 0 to 4 percent

Meadowville Series: very deep and well drained and moderately well drained; formed in colluvial materials and partly in materials weathered from muscovite schist and gneiss; in depressional areas on toe slopes; along drainageways, and in saddle positions in northern part of Piedmont Plateaus; flooded for very brief periods after heavy rains; slopes range from 0 to 5 percent

US Army Corps of Engineers
Toxic and Hazardous Materials Agency

Plateau. They are on low stream terraces adjacent to floodplains. Flooding is rare. Slopes range from 2 to 7 percent.

Featherstone Series:

The soils of the Featherstone series are very deep and very poorly drained. They formed in Coastal Plain sediments at an elevation of less than 2 feet. The water table is commonly at the surface, and most areas are subject to ponding. Slopes range from 0 to 1 percent.

Marumsco Series:

The soils of the Marumsco series are very deep and moderately well drained and somewhat poorly drained. They formed in stratified marine sediments of the low Coastal Plain terraces. The soils are in depressional areas. Slopes range from 0 to 4 percent.

Meadowville Series:

The soils of the Meadowville series are very deep and well drained and moderately well drained. They formed partly in colluvial materials and partly in materials weathered from muscovite schist and gneiss. They are in depressional areas on toe slopes, along drainage ways, and in saddle positions in the northern part of the Piedmont Plateau. These soils are flooded for very brief periods after heavy rains. Slopes range from 0 to 5 percent.

Representative mechanical analyses for four areas at WRF were performed by the Cooperative Extension Service, Soil Testing Laboratory, University of Maryland prior to 1983. Results of these analyses are shown in Table 2-2.

2.3.5 REGIONAL GEOLOGY

The regional geologic setting at WRF is described below. A map depicting the geologic setting of WRF is shown in Figure 2-5.

The Woodbridge Research Facility site and in general the whole eastern edge of Prince William County are comprised of coastal plain sediments that dip and thicken toward the east to form a wedge. Underlying the coastal plain sediments are undifferentiated Paleozoic meta-sedimentary and meta-igneous rocks. Well borings performed by the U.S. Geological Survey indicate that bedrock depth ranges from approximately 94 to 105 feet below ground surface less than one-fourth mile to the northwest of WRF at the Arban Carasi, Inc. well sites. However, two wells drilled into the lower Potomac aquifer approximately one-half mile away in the central part of the WRF site indicated bedrock at a depth of approximately 150 feet below ground surface. The overlying sediments are principally gravels, sand, and clay of the Cretaceous-age Potomac group.

Table 2-2

Mechanical Soil Analyses of Four Areas at WRF

Area	%Sand	%Silt	%Clay
Compound	40.8	36.4	22.8
Housing	35.2	39.4	25.4
Picnic	42.8	37.4	19.8
Antenna	59.0	28.6	12.4

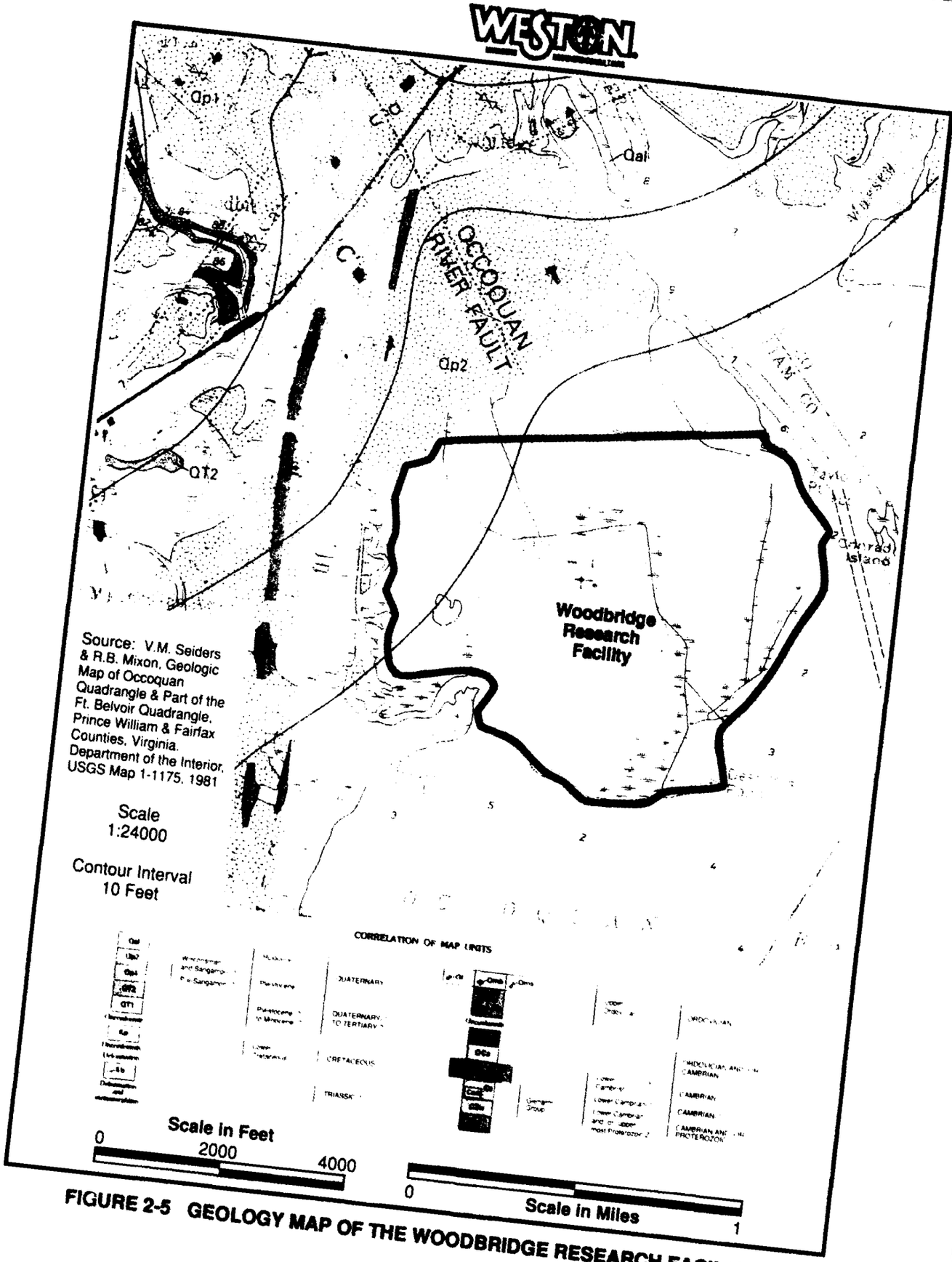


FIGURE 2-5 GEOLOGY MAP OF THE WOODBRIDGE RESEARCH FACILITY

The upper surficial sediments include terrace and alluvial deposits of Pleistocene and Holocene (recent) ages. Descriptions of the types of units as described by the USGS are given below.

Alluvium (Holocene) - Mud, sand, and gravel that form narrow floodplains along minor streams. This includes mud, muddy sand, and peat in swamps and marshes bordering tidal tributaries of the Potomac River and may include some colluvium.

Younger River Terrace Deposits (Pleistocene) - Gravelly and sandy deposits underlie the lower two terraces of ancestral Potomac and Occoquan Rivers (QT2 and QP2). The younger unit (QP2) underlies terraces 35 and 40 ft in altitude. This includes stream deposits under terraces in valleys of Pohick Creek and Giles Run graded to the same level as more extensive Potomac River terraces in adjacent areas. These units correlate with Potomac River deposits mapped in the Quantico quadrangle (Mixon et. al., 1972).

QT2 deposits consist of loose-crossbedded medium to coarse feldspathic quartz sand, pebbly in part, and massive to thick-bedded clayey and silty sand, commonly pale yellowish gray to reddish gray. Pebbles are mostly quartz, metamorphic rock of various types, and red shale and sandstone. The less dissected terrace surfaces are at an altitude of 35 to 40 ft, and the base of the unit extends below sea level. The unit is very poorly exposed within the map area, but representative sections are well exposed in wave-cut cliffs bordering Occoquan Bay.

QP2 deposits consist of sandy gravel and feldspathic quartz sand very similar to that of unit QT2. Basal beds are commonly cobble gravel composed mainly of quartz, quartzite, and lesser amount of chert and sandstone. Deposits are confined to small hilltop areas near the mouth of the Occoquan River and to the Gunston Heights area of Mason Neck. QP2 is much more extensive east and northeast of the map area in the northern part of Mason Neck, lower Pohick Creek and Accotink Creek drainage basin, and in the vicinity of Fort Belvoir. The altitude of the top of terrace deposits is commonly 145 to 160 ft; the base of deposits ranges from 120 to 140 ft in altitude.

The Potomac Formation (Lower Cretaceous) includes three different facies, listed below in order of abundance:

Type 1 - consists of medium to coarse feldspathic quartz sand, very light gray to pinkish gray in outcrop; fresh material in test borings may be greenish gray; locally oxidized to yellow, orange, and brown. Matrix is clay-silt that may constitute 40 percent or more of the sediment. Crossbedded sand units are generally 0.5 to 4 ft thick; trough crossbedding predominates. Gravelly sands contain pebbles and cobbles of vein quartz and quartzite or, less commonly, other metamorphic rock types. Intraformational conglomerate clasts are pebbles of clay and silt; locally, boulders of clay-silt are as much as 2 or 3 ft in maximum dimension. Type 1 sediments probably represent channel-lag and channel-bar or point-bar deposits.

Type 2 - consists of silty clay, clayey silt, and clayey fine sand; greenish gray; commonly mottled red or reddish brown; clay minerals are predominantly montmorillonite and illite. Commonly forms clay-silt plugs, 2 to 10 ft thick and 60 ft or more wide, within a dominantly medium to coarse sand sequence. Plugs are probably result of filling of abandoned stream channels by fine sediments during flood stages. Ccalified stems of plants, including trunk-size material 1 ft or more in diameter, are common in types 1 and 2; silicified tree trunks are present but rare.

Type 3 - consists of dark yellowish-brown to olive-gray lignitic sandy silt and clay; contains well-preserved leaf and stem impressions of ferns, cycads, and gymnosperms. Occurrences as thin to thick beds within sediment type 1 suggests deposition in swampy areas of floodplains. The Potomac Formation thickens from a feather edge along the northwest margin of outcrop in Dale City and Agnewville to about 300 ft in Marumsco Woods area of Woodbridge. Analysis of pollen from Potomac Formation in Fort Belvoir, Occoquan, and Quantico quadrangles indicates an Early Cretaceous (Aptian and Albian) age (Mixon and Seiders, 1981).

2.3.6 REGIONAL HYDROGEOLOGY

Groundwater availability in the Coastal Plain sediments is generally good, although the limited areal extent and relative thinness of the sediments in Prince William County restrict the amount that can be developed.

Sufficient yields for domestic or light industrial use (up to 50,000 gallons per day (gpd)) are generally available at most locations in the Coastal Plain. Well yields averaging 250,000 gpd can be expected in the southeastern portion of the Coastal Plain. The highest water-yielding zones can be expected between 200 and 350 feet below sea level.

The surface of the water table is rarely flat, usually displaying undulations conforming to the topography. The water table is higher under hills than under valleys. However, the relief of the water table surface is more subdued than the topographic relief. Therefore, the depth to the water table is greater under a hill than under a valley. The variation of water table elevation and the force of gravity cause movement of the groundwater. Groundwater flows through the interconnected pore spaces in sediment and in fissures in rock. The rate of movement ranges from a few inches per year to a few feet per day.

Due to the presence of laterally extensive sand beds, Coastal Plain sediments are good aquifers. Unfortunately, the sand beds comprise a much smaller proportion of the sediments than the clay beds. The average yield for four wells drilled to less than 200 feet in the Coastal Plain is 101 gpm; for 9 wells between 200 and 400 feet, 137 gpm; and for two wells from 400 to 600 feet, 211 gpm.

Groundwater from the Coastal Plain sediments is soft to moderately hard and contains low to moderate amounts of dissolved mineral matter. The water is harder along the

western margin of the Coastal Plain near the Fall Line and is softer to the east. The iron content is commonly excessive and the water is acidic to slightly alkaline. Fluoride is often present but not in excessive amounts, and bicarbonate is the most common nonmetal ion. Sulfate, nitrate, and chloride may also be present (VWCB, 1991).

There are three shallow water wells on the facility, which are not currently used.

2.3.7 SENSITIVE ENVIRONMENTS

2.3.7.1 Wetlands

Approximately 150 acres of WRF is classified as wetlands on tidally influenced marshes or swamps (NRMP, 1991). The wetlands are diverse and support a wide variety of wildlife. Dominant wetland plants include:

- Broad-leaved Cattails (Typha latifolia)
- Pickerelweed (Pontederia cordata)
- Wild Rice (Zizania aquatica)
- Arrowarum (Peltandra virginica)
- Sword Grass (Scirpus americanus)
- Red Maple (Acer rubrum)
- Silver Maple (Acer saccharinum)
- Red Cedar (Juniperus virginiana)
- White Willow (Salix)
- Burr Reed (Sparganium eurycarpum)
- Yellow Pond Lily (Nuphan variegatum)

WRF is bordered on the west by Marumsco National Wildlife Refuge, a large wetland system that serves as a feeding and nesting area for many species of waterfowl including herons, black ducks, and wood ducks. The same species occur and perhaps nest at WRF as at Marumsco. From a joint program with the U.S. Fish and Wildlife Service and the Laboratory, a list has been developed of birds and other wildlife that have been sighted at WRF and Marumsco National Wildlife Refuge. WRF is a rich area for waterfowl and other wildlife.

2.3.7.2 Flora and Fauna

WRF contains a great diversity of habitat types and resultant edge habitats. Habitat types include floodplain and upland forests, tidal marsh, wooded swamp, shrubland, open water, and disturbed habitat (mowed fields). WRF borders Marumsco National Wildlife Refuge, a large palustrine marsh system managed by the FWS.

The following are lists of native plant species identified in the Natural Resources Management Plan prepared by the U.S. Army Laboratory Command (LABCOM) as available for wildlife in the vicinity of WRF:

- Virginia Pine (Pinus virginiana)

- White Oak (Quercus alba)
- Pin Oak (Quercus palustris)
- Northern Red Oak (Quercus borealis)
- Black Locust (Robinia pseudacacia)
- Eastern Red Cedar (Juniperus virginiana)
- Flowering Dogwood (Cornus florida)
- American Holly (Ilex opaca)
- American Sycamore (Platanus occidentalis)
- Willow Oak (Quercus phellos)
- Silver Maple (Acer saccharinum)
- Red Maple (Acer rubrum)
- White Ash (Fraxinus americana)
- Bitternut Hickory (Carya cordiformis)
- Sweetgum (Liquidambar styraciflua)
- Black Cherry (Prunus serotina)
- American Beech (Fagus grandiflora)
- Broomsedge (Andropogon spp.)
- Tall Fescue (Festuca eliator)
- Barnyard Grass (Echinocola crusgalli)
- Duckweed (Lemna minor)
- Mountain Laurel (Kalmia latifolia)
- Honeysuckle (Lonicera fragrantissima)
- Virginia Creeper (Parthenocissus quinqefolia)
- Staghorn Sumac (Rhus typhina)

A fence around the installation controls immigration and emigration of large species (primarily white-tailed deer). The primary activities affecting populations at WRF are deer hunting, fishing, and pond stocking. Deer hunting had been discontinued for several years, resulting in a large population increase and an unhealthy herd. Hunting has been reinstituted and will be used as necessary to control the population. Following a post- and pre-harvest deer census, the number of hunting days and hunters will be determined. An effort will be made to keep the population at carrying capacity, estimated at 50 to 60 deer.

Other species are limited by food resources and other habitat considerations and by predation, mainly from birds of prey and foxes.

According to the Natural Resource Management Plan (NRMP, 1991), largemouth bass, bluegill, gizzard shad, white perch, American eel, and perhaps channel catfish inhabit a two-acre pond at WRF. An Inter-Service Support Agreement (ISSA) has been implemented between WRF and the U.S. Fish and Wildlife Service, Office of Fishery Assistance (NRMP, 1991). The agreement consists of the following:

- A qualitative fish survey of the pond to evaluate species diversity, relative abundance, and reproductive success of all fish species.

- Water quality analyses of the pond water.

- Technical assistance throughout the year to monitor and correct biological problems associated with the fishery program.

- An annual report on current survey results and management recommendations.

As part of the ISSA, channel catfish fingerlings have been stocked in the WRF pond for 3 successive years. Results have been unsuccessful, probably due to predation or neglect of the feeding program outlined by the Office of Fishery Assistance. The catfish stocking program was attempted a fourth time in 1991, although results have not yet been assessed.

Currently, employees of WRF and their immediate families are permitted to fish the pond as long as they have a Virginia fishing license and a WRF fishing permit. Permits and guidelines for the pond are developed in cooperation with the Office of Fishery Assistance and are updated annually. Fish populations are monitored and creel limits set to ensure a balanced population in the pond. Bowfishing for carp and other gamefish in the tidal waters at WRF is allowed according to Virginia fishing regulations.

The natural fish population in the pond remains relatively stable, with fishing pressure an extremely minimal factor in control. Habitat, size of the pond, and food availability are the limiting factors for the fish population.

Habitat for the bald eagle is present on the facility, although no nests have been documented. Bald eagles use the site as a resting and feeding area. The most commonly used areas are along Belmont Bay from the old Belvoir Bridge to the picnic ground.

A literature review from the Virginia Natural Heritage Program determined the presence of endangered or threatened species that occur or may occur at WRF. These species are listed in Table 2-3.

Beavers have constructed dams along an unnamed creek that drains the site. They also regularly block the culvert that drains into Occoquan Bay. Due to the low-lying nature of the site, the dams have caused flooding and undermining of the perimeter roadway. "Beaver bafflers" are being placed in the culverts to diminish the potential of roadway flooding (Menzcer, 1991).

Other wildlife frequently encountered in the vicinity of WRF and the adjacent Marumsco National Wildlife Refuge include the following:

- Carp (Cyprinus carpio)
- Channel Catfish (Ictalurus punctatus)
- Bluegill (Lepomis macrochirus)
- Largemouth Bass (Micropterus salmoides)

Table 2-3

Endangered or Threatened Species That Occur or May Occur at WRF

Common Name	Scientific Name	Status
River Otter	Lutra canadensis lataxina	Endangered
Canadian Beaver	Caster canadenses canadensis	Extirpated
Loggerhead Turtle	Caretta caretta	Endangered
Bald Eagle	Haliaeetus leucocephalus	Endangered
Sharp-shinned Hawk	Accipiter straitus	Threatened
American Kestrel	Falco sparverius	Threatened
Bewick's Wren	Thryomanes bewickii	Threatened
Loggerhead Shrike	Lanius ludovicianus	Threatened
Henslow's Sparrow	Passerherbulus henslowii	Threatened
Osprey	Pandion haliaetus	Threatened
Striped Bass	Morone saxitilis	Threatened

- White Perch (Morone americana)
- Gizzard Shad (Dorosoma cepedianum)
- American Eel (Anguilla rostrata)
- Muskrat (Ondatra zibethicus)
- Woodchuck (Marmota monax)
- Beaver (Castor canadensis)
- Raccoon (Procyon lotor)
- White-tailed Deer (Odocoileus virginianus)
- Gray Squirrel (Sciurus carolinensus)
- Gray Fox (Urocyon cinereoargenteus)
- Eastern Cottontail (Sylvilagus floridanus)
- Bobwhite (Colinus virginianus)
- Mallard (Anas platyrhynchos)
- Black Duck (Anas rubripes)
- Canada goose (Branta canadensis)

Additionally, the following birds have been identified in a recent study by LABCOM as of special concern or undetermined status:

Special Concern

Great Blue Heron (Ardea herodias)
Little Blue Heron (Florida caerulea)
American Egret (Casmerodius albus)
Black-crowned Night Heron (Nycticorax nycticorax)
Glossy Ibis (Plegadis falcinellus)
Red-shouldered Hawk (Buteo lineatus)
Eastern Bluebird (Sialia sialis)
Grasshopper Sparrow (Ammodramus savannarum)

Status Undetermined

Yellow-crowned Night Heron (Nyctanassa violacea)
Least Bittern (Ixobrychus exilis)
American Bittern (Botaurus lentiginosus)
Cooper's Hawk (Accipiter cooperii)
Florida Gallinule (Gallinula chloropus)
Black-billed Cuckoo (Coccyzus erythopthalmus)
Barn Owl (Tyto alba)
Yellow-bellied Sapsucker (Sphyrapicus varius)
Greater Siren (Siren Lacertina)

For additional information on plant and wildlife at WRF, the Natural Resources Management Plan (NRMP, 1991) and the Environmental Assessment (LABCOM, 1989) for WRF should be consulted.

2.3.7.3 Archeological Investigations at WRF

A review of available information sources pertaining to the prehistoric and historic archeology of WRF was conducted by WESTON. The review indicated that three prehistoric and three historic sites are known to exist on WRF property and are shown in Figure A-1 located in Appendix B (excerpts from the WRF Archeological Overview and Management Plan). Specific potential archeological historic artifacts were also reported and are located in Figure A-2 in Appendix B. These include artifact scatters, a historic fisheries facility, a colonial cemetery, a historic ferry landing, and a prehistoric lithic scatter for which exact locational data is unavailable (Thunderbird, 1985). The physical integrity of the known and potential sites is unknown. Only a portion of these sites are believed to possess sufficient significance to be potentially eligible for the National Register of Historic Places (NRMP, 1991). Because WRF occupies one of the few relatively undisturbed locations in the area, the potential significance of its archeological remains is considered to be of a high order.

Portions of WRF have been disturbed by construction of new structures and excavation of soils for landfilling purposes. However, large portions of the facility are essentially undisturbed. The presence, location, and physical integrity of the archaeological cultural resources within any of these areas cannot be determined at this time (Thunderbird, 1985).

For further information regarding archeological and historical perspectives at WRF, the Archeological Overview and Management Plan for Harry Diamond Laboratories - Woodbridge Research Facility (1985) and the Harry Diamond Laboratories Cultural Resource Management Plan (1991) should be consulted.

2.4 ENVIRONMENTAL STUDIES AT WRF

Numerous environmental studies have been published on some aspect of WRF. Those obtained by WESTON and used directly in preparation of this assessment report are discussed chronologically below.

An Installation Assessment of ERADCOM Activities was completed by Environmental Science and Engineering, Inc. (ESE) for three activities, one of which was Woodbridge Research Facility. An on-site records search identified underground petroleum, oil, and lubricant (POL) storage tanks on the site. Recommendations for periodic POL storage tank testing at the sites are given. USATHAMA recommends no site investigation surveys at this site (ESE, 1981).

A Plan for the Assessment of Contamination at Woodbridge Research Facility was completed by ESE in April 1984. This work plan was compiled upon the direction of USATHAMA through the Department of the Army due to the determination that polychlorinated biphenyl (PCB) contamination may exist at the facility disposal site known as Landfill No. 2. The plan includes background data and sampling results from surface water and soil sampling that took place in February 1984 during the

Preliminary Phase Assessment. The plan also includes detailed descriptions of the proposed Confirmatory Phase Assessment (ESE, 1984).

A Remedial Investigation and Feasibility Study at Woodbridge Research Facility was completed by ESE in June 1984. This assessment included results of the Preliminary Phase, which was performed in February 1984, and a Confirmatory Phase, which was completed in June 1984. The assessment report details PCB contamination findings at Landfills No. 1 and No. 2. Recommendations for remedial action alternatives are discussed (ESE, 1985).

An Archeological Overview and Management Plan for the Harry Diamond Laboratories - Woodbridge Research Facility was completed by Thunderbird Archeological Associates, Inc. and Envirosphere Co. in July 1985. This report was completed through sponsorship of the National Park Service, U.S. Department of the Interior. The report was prepared as part of an interagency technical services agreement to develop facility-specific archeological overviews and management plans for U.S. Army Materiel Development and Readiness Command. Recommendations are made for detailing archeological resources present on the Woodbridge facility through further studies (Thunderbird, 1985).

The Final Report for the Remediation of PCB Contamination at Woodbridge Research Facility was completed by Roy F. Weston, Inc. in May 1986. This final report was prepared for USATHAMA and the U.S. Army Corps of Engineers, Huntsville District. The report details site preparation, removal and disposal operations for PCB contamination, and restoration of the Landfill No. 2 area, which contained PCB-contaminated soil and debris. Also included are analytical results of soil and water sampling performed at Landfills No. 1 and No. 2 (WESTON, 1986).

An Environmental Assessment of the Woodbridge Research Facility Operations was completed by the U.S. Army Laboratory Command (LABCOM), Harry Diamond Laboratories at Woodbridge Research Facility, and LABCOM's Installation Support Activity in July 1989. This assessment was by direction of the National Environmental Policy Act. Its purpose was to determine any significant impact the Woodbridge facility might have on the surrounding environment (LABCOM, 1989).

A Master Plan Report (Preliminary), for the U.S. Army, Adelphi Lab Command (USAALC), Woodbridge Research Facility was compiled by the Department of the Army in April 1990 to detail the vital statistics of the Woodbridge facility and the capability of the existing facilities to accommodate the assigned mission. The document includes future growth plans, maps, and the current function and capacity of the facility (LABCOM, 1990).

A Preliminary Assessment Report for Woodbridge Research Facility was completed by Roy F. Weston, Inc in September 1990 in conjunction with the EPA objective of facility prioritization under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). This document contains all information about the facility

collected by USATHAMA, including information regarding waste sites and storage of chemicals (WESTON, 1990).

The Harry Diamond Laboratories Cultural Resource Management Plan (Draft Report) was compiled by Kise, Frank, and Straw (KFS) Historic Preservation Group in June 1991 for the U.S. Army Corps of Engineers, Baltimore District. This management plan details significant historical and archeological information in and around the Woodbridge facility and other LABCOM facilities (KFS, 1991).

An as-yet-unpublished draft of the Natural Resources Management Plan for Woodbridge Research Facility is a comprehensive compilation of information and projected management practices regarding the natural resources found on and around the facility, including fish/wildlife and land management practices (NRMP, 1991).

2.5 PERMITTING STATUS

2.5.1 RCRA FACILITIES

WRF (EPA I.D. No. VA 7210020981) is listed on the Virginia Hazardous Waste Activity Notifiers List as a small-quantity generator of hazardous waste and is on the U.S. EPA CERCLIS (Superfund) List (E.D.I., 1991). This listing is due to the discovery in 1984 of PCB transformers in a former landfill site within the facility (Landfill No. 2). To date, no permit applications have been filed. However, 940.75 tons of PCB-contaminated soils were exhumed from the site and transported to a hazardous waste disposal facility in Model City, New York in accordance with Federal Regulations 40 CFR 262.20-262.23 and 40 CFR 263.10-263.11 and Virginia Department of Hazardous Waste Management Regulations, Section 76 (WESTON, 1986). This waste was removed between 1 April and 17 April 1985 (Appendix C).

2.5.2 NPDES PERMITS

In 1977, WRF submitted an application for a point source discharge permit for an emergency overflow pipe at Building 301 believed to be under regulation. The application was filed with U.S. Environmental Protection Agency (EPA) for a National Pollutant Discharge Elimination System (NPDES) permit. The EPA then forwarded the application to the VWCB for review. No further action has been taken by the state or by WRF (VWCB, 1991).

An oil/water separator site on the west side of Building 202 within the compound, which is used only on an intermittent basis, may periodically collect effluents from wash racks and vehicle maintenance activities. An NPDES permit application was also filed but no further action has been taken. According to the VWCB regional office, no permit is required for either of these sites at this time since the discharge quantity is very low and the potential impact on the environment is minor.

2.5.3 MECHANICAL PERMITS

WRF was granted mechanical permit number 92-700857-M-00 on 6 September 1991 by Prince William Co. for the purpose of removing a 1,000-gallon fuel oil tank from the guardhouse (Building 101). During the site reconnaissance, it was apparent that this tank had been removed, but was still on-site as shown in Photo 15 and 16.

On 27 February 1990, WRF was granted permit number 9479 by the Prince William Co. Fire Marshall's office for the installation of one 1,000-gallon UST and the removal of two 10,000-gallon USTs and one 1,000-gallon UST near Building 202 at WRF (Appendix G).

Based on the efforts and findings of this assessment, WRF holds no other current permits for either solid waste or hazardous waste, air or water pollutant emissions, or regulatory commission requirements.

SECTION 3

AREAS REQUIRING ENVIRONMENTAL EVALUATION

In this section, AREEs at WRF are documented. The AREEs were selected based on evaluation of existing documentation and on the WESTON site visit. Table 3-1 provides a listing of all AREEs by number, and the locations of these are shown in Figure 3-1. Facility-wide AREEs are not shown due to their extensive nature.

3.1 LANDFILLS

Based on information obtained from a review of facility records and through personal interviews at the facility, five landfill sites and two potential landfill sites were identified. Use of the landfills ended in 1973. In 1984 it was learned that PCB-containing materials had previously been disposed of in Landfill No. 2. Landfill No. 2 was excavated of all PCB contaminated debris in 1985. As discussed below, Landfill No. 1 and Landfill No. 2 each have six monitoring wells around them. Specific information related to the history and nature of each landfill is contained in the following subsections.

Landfills are regulated by the Commonwealth of Virginia's Department of Waste Management. The state regulations specify three categories of landfills: sanitary, construction/demolition/debris, and industrial. WRF's landfills may be considered construction/demolition/debris. As such, they may be required to be formally closed in accordance with state regulations (VDWM, 1989).

3.1.1 LANDFILL NO. 1 (AREE 1)

Landfill No. 1 is a 0.4-acre site located in the southern section of the facility at the intersection of Deephole Point Road and Shady Road. It is located next to Occoquan Bay and just east of the mouth of Marumsco Creek, as shown in Figure 3-1 and in Photograph 1. The landfill was used as a dumping site for construction debris, including concrete, scrap metal, etc. (ESE, 1981). During the site reconnaissance, additional materials were identified at the landfill, including asphalt pavement, copper and steel wire, ceramic insulators, and piping wrapped with insulation (Photograph 2). Some of the insulation appears to be old pipe lagging, which commonly contains asbestos (Photograph 3).

There is no record of when the dumping began at this site; however, all dumping was reportedly stopped in 1973. In 1973, a trench approximately 60 feet long was bulldozed in order to bury wooden boxes along the slope. The reason for this activity was, at least in part, to provide shore erosion control (ESE, 1981; Allen, 1991). Additionally, some capacitors may have been dumped at the site prior to closure of the landfill (Allen, 1991).

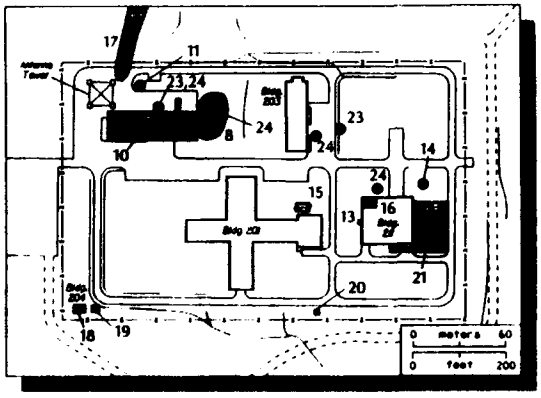
Table 3-1

List of AREEs
Woodbridge Research Facility

AREE No.	Description
1	Landfill No. 1
2	Landfill No. 2
3	Landfill No. 3
4	Landfill No. 4
5	Landfill No. 5
6	Potential Landfills
7	Pistol Range
8	UST Leaks and Spills
9	Salt in Soil Test Area
10	Maintenance Shop
11	Oil/Water Separator
12	Drum Storage Area
13	Acid Neutralization Tank
14	Oil/Water Separator
15	Transformers
16	Asbestos
17	Spill Areas
18	Flammable/Battery Storage
19	Thermal Battery Storage
20	Former Incinerator
21	Former Storage Area
22	Drainage Ditch
23	Former Underground Storage Tanks
24	Existing Underground Storage Tanks
25	Sewage Injection Area
26	Buried Antifreeze in Hoses
27	Buried Wire

U. S. Army
Base Closure Preliminary Assessment
Woodbridge Research Facility
Woodbridge, VA – December 1991

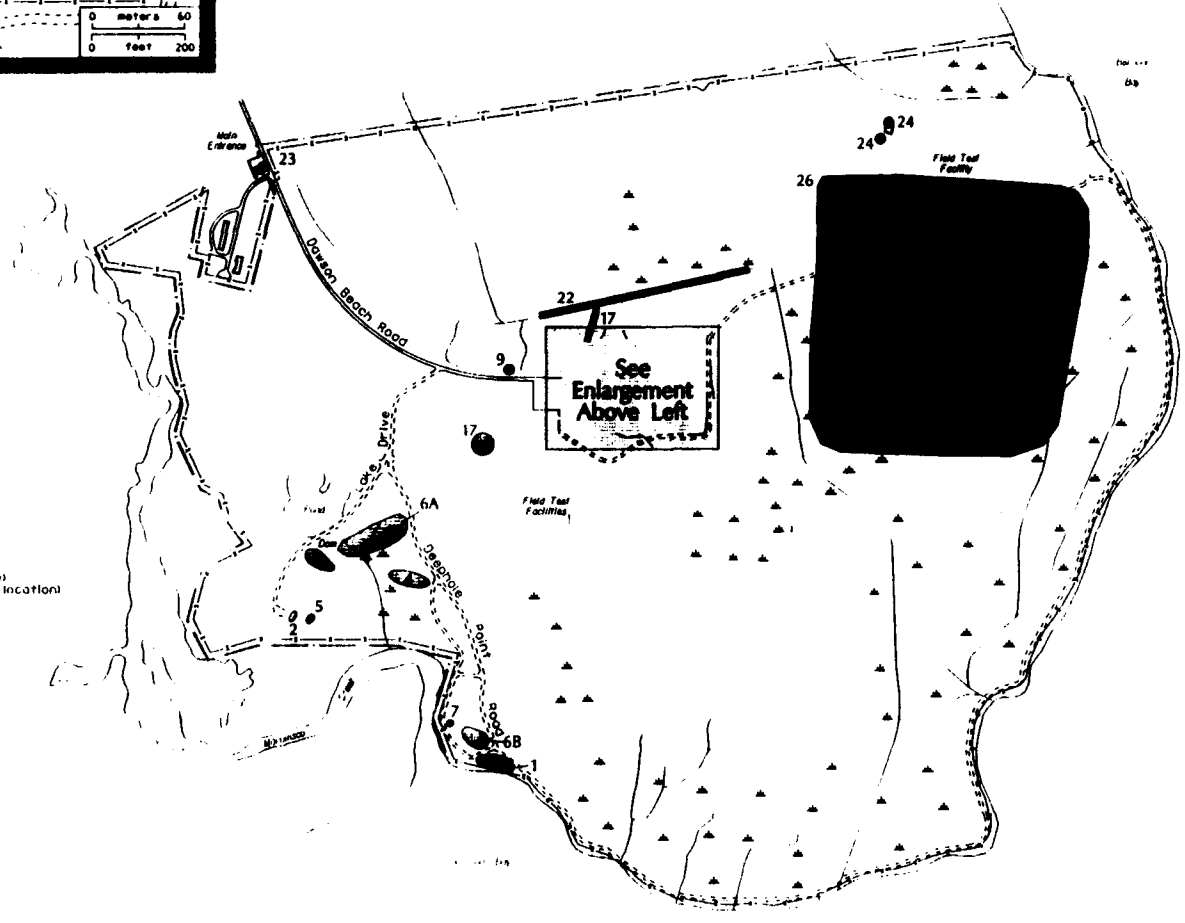
Figure 3-1
Areas Requiring Environmental Evaluation



Installation Boundary
Hydrography
Road/Pavement Edge
Gravel Edge
Railroad
Powerline
Pipeline
Fence
Structure

Compiled in 1991 from various sources provided by the U.S. Army Toxic and Hazardous Materials Agency

0 meters 200
0 feet 800



1. Landfill Number 1
2. Landfill Number 2
3. Landfill
4. Landfill
5. Landfill
6. Potential Landfill (2 Locations)
7. Pistol Range
8. UST Leaks and Spills
9. Salt In Salt Test Area
10. Maintenance Shop
11. Oil/Water Separator
12. Drum Storage Area
13. Acid Neutralization Tank
14. Oil/Water Separator
15. Transformer
16. Asbestos In Buildings
17. Oil Spill Areas (2 Locations)
18. Flammable Storage
19. Thermal Battery Storage
20. Former Incinerator
21. Former Storage Area
22. Drainage Ditch
23. Former Underground Storage Tanks
24. Underground Storage Tanks
25. Sewage Spreading Area (not shown; throughout northern part of facility)
26. Buried Antifreeze Pipes (approximate location)
27. Buried Wire (throughout facility)
28. Radon (not shown)

24 AREE Number
AREE

US Army Corps of Engineers
Toxic and Hazardous Materials Agency

Activities at the landfill site have included practice firing of small arms into the landfill embankment. This was done during the 1950s and 1960s for an unknown duration (Allen, 1991).

A remedial investigation study done between January and May of 1984 by Environmental Science and Engineering, Inc. (ESE) revealed that soils from this landfill contained detectable levels of PCBs (0.2 to 5 mg/g). Bis (2-ethylhexyl) phthalate and di-n-octyl phthalate were both detected in a surface water sample collected at the site (ESE, 1985). The concentration for Bis (2-ethylhexyl) phthalate is considerably less than the limit established by EPA for human health (15 mg/L for ingestion of water and 50 mg/L for ingestion of aquatic organisms) as presented in the USEPA 1983 National Secondary Drinking Water Regulations.

In January and February of 1985, six monitoring wells were installed at the site (one of which is shown in Photograph 4). A groundwater sampling program for PCB analysis was then implemented (Weston, 1986), during which samples were collected over a 4-year period between 1987 and 1990. A review of the analytical data was conducted, and no detectable concentrations of PCBs were found in any of the groundwater samples collected (IRLMIS, 1991).

3.1.2 LANDFILL NO. 2 (AREE 2)

The site of Landfill No. 2 is located near the southwestern corner of WRF as shown in Figure 3-1 and in Photograph 5. It is situated in a cleared field at the end of Lake Drive, adjacent to a wooded area leading to Marumsco Creek. At the time of the recent site reconnaissance, a ground scar was apparent at the landfill site. According to facility personnel, the ground scar is the result of backfilling in order to level off the site, which had settled since 1985 when it was excavated for removal of contaminated soil and debris.

In January of 1984, an employee of WRF notified the environmental section of the U.S. Army Harry Diamond Laboratories (HDL) that transformers and capacitors were buried in a disposal trench at this location. The burial of these items reportedly occurred in 1970 and 1971. Transformers and capacitors are commonly found to contain potentially hazardous PCB compounds. HDL hired Versar, Inc. to collect soil and water samples from the area. These samples indicated PCB contamination within the excavation site (ESE, 1984). In February 1984, USATHAMA initiated action to define and quantify PCB contamination at the installation.

The landfill was excavated in 1985 by WESTON. Six transformers and 85 capacitors were recovered, and PCB-contaminated soil was excavated until it tested to be clean of PCB. The transformers, other debris, and soil were disposed of at a hazardous waste landfill in New York.

The disposal trench measured approximately 150 feet long and 22 feet wide, with an average depth of 5.75 feet below ground surface. Approximately 700 cubic yards (940.75 tons) of material were removed during the exhumation activity.

Five monitoring wells were installed downgradient of the trench, and one monitoring well was installed upgradient. In addition, two piezometers were installed for background water level readings. One such piezometer is shown in Photograph 6. The monitoring wells were screened at depths varying from 7 to 28 feet in order to determine contaminant-to-depth correlations (ESE, 1985).

A groundwater sampling program for PCB contamination was then implemented (WESTON, 1986). Samples were collected over a 5-year period, 1985 to 1990. PCB concentrations of up to 7 μg/L were found in recent water samples from MW2 and MW3. The concentrations of PCB in the samples have been increasing annually.

Photographs 6, 7, and 8 show typical settings for the wells. Photograph 7 is a view of the upgradient well MW1, with a discarded empty storage drum shown in the background. Photograph 8 is a view of MW4 and MW5, which are situated near the center of the former landfill and slightly downslope.

3.1.3 LANDFILL NO. 3 (AREE 3)

A landfill is located just east of the pond on the east side of Lake Drive. During interviews with facility personnel, it was reported that wood debris and wire coated with lead, paper, and plastic were dumped here before the site was covered with soil in 1973 (Allen, 1991).

Based on aerial photography reviews (USEPA, 1991), some debris may have been dumped or stored at this site as early as 1966, although most of the activity is thought to have occurred during the early 1970s.

The approximate dimensions of the landfill are 100 feet by 25 feet by 10 feet deep (Allen, 1991).

3.1.4 LANDFILL NO. 4 (AREE 4)

Another landfill is located just south of Deephole Point Road along the cleared sloped face leading down to the ravine and marsh area east of Shady Road. Aerial photographs (USEPA, 1991) show that ground scars and excavation activity have been prevalent at this site since at least 1962. During the September 1991 site reconnaissance, numerous pieces of wire, including copper wire and metal debris, were found on the surface of the site. The soil slope surface was eroded and poorly vegetated, possibly suggesting recent coverage with backfill. Interviews with facility personnel revealed that the site was operated as a dump site from the late 1950s until 1973, at which time it was closed and covered (Allen, 1991). Materials in this landfill reportedly include wire, wood, concrete, metal, pipe insulation, and empty oil drums.

3.1.5 LANDFILL NO. 5 (AREE 5)

A landfill is located near the old site of Landfill No. 2 that reportedly contains metal debris only (Allen, 1991). This landfill operated during the 1950s and 1960s and was

closed before 1970. An approximately 5-foot-high earthen mound was observed during the site visit. The mound is covered with vegetation, but metal debris is visible sticking out of the soil (Photograph 9). Ground scars and excavations with debris were noted in 1966 and 1975 during the aerial photograph assessment (USEPA, 1991).

3.1.6 POTENTIAL LANDFILLS (AREE 6)

There are two potential landfills (AREE 6A and AREE 6B) that were deemed to require evaluation based on the assessment of the aerial photographs (USEPA, 1991). Ground scars and soil disturbance were observed in the photographs for 1966, 1975, and 1979. The locations of the two areas are indicated in Figure 3-1. Debris such as cable and pipe was noticed on the ground during the site visit.

3.2 PISTOL RANGE (AREE 7)

Facility personnel reportedly used an embankment north of Landfill No. 1 as a pistol range for qualification of small arms firing on a semi-annual basis during the 1970s. This activity occurred for an unknown number of years before the firing range was covered with backfill material and firing practice was stopped as a regular activity at WRF (Allen, 1991).

The pistol range site is located between Deephole Point Road and Shady Road and is approximately 75 yards west of Landfill No. 1 on an open hillslope, as shown in Photograph 10. In a review of aerial photographs of the site, ground scarring is apparent in these areas from 1966 to 1975 (USEPA, 1991).

No environmental studies are documented to date for the pistol range. Possible contaminants would be lead from the bullets.

3.3 UST LEAKS AND SPILLS (AREE 8)

The surface and subsurface areas to the east of Building 202 (Maintenance Building) appear to be contaminated with oil from overfilling of USTs and/or from leaking USTs.

Two 10,000-gallon no. 2 heating oil tanks were removed from this area in June 1990 after failing leak tests that had been conducted in November 1989. Soil samples analyzed for total petroleum hydrocarbons were found to contain less than 25 mg/kg. An adjacent 10,000-gallon tank had been removed in 1981 after a leak was observed. This tank was replaced with a 2,000-gallon fiberglass UST (see Subsection 3.8.2). There is no record of any soil sample being taken during this tank removal (Feustle, 1991).

Several oil spills were reported in the area around the three former 10,000-gallon USTs to the east of Building 202. Photograph 11 looks east towards the grassy area where the tanks were formerly located. One spill, which occurred during the late 1970s, reportedly involved 2,000 to 4,000 gallons. These spills occurred during filling of the tanks or while pumping oil from the tanks to another vehicle for transfer to one of the

smaller USTs. The spills were contained with sand bags and absorbent material, and some soil was excavated and removed to Ft. Belvoir for disposal (Allen, 1991). It is not known if any soil testing was done. The ground in that area slopes to the north toward the drainage ditch (AREE 22).

During the site visit, the condensate return tank pit located in the electrical switch room in Building 202 contained what appeared to be several inches of water covered with an oily sheen. Reportedly, water and oil seep into the approximately 15-foot-deep pit after every rain (Allen, 1991). This pit is located approximately 20 feet from the former UST locations detailed above.

3.4 MAINTENANCE SHOP (AREE 10)

Building 202 is the maintenance shop (see Figure 3-1). Activities performed there include vehicle maintenance, carpentry, and minor electrical repairs. Materials stored in Building 202 include motor oil, solvents, brake fluid, battery acid, paint, and thinner. The building consists of several rooms. The motor pool is in the center of the building, with overhead doors opening to the north. Carpentry supplies and paints are stored in rooms on the west, and the room to the east contains electrical switching and circuit breaker equipment. The building has concrete floors with no floor level drains or curbs at the exterior doors.

The carpentry area has a metal locker for flammables containing approximately 10 gallons of paint and thinner. No significant wastes are generated in this area.

The motor pool is used for oil changes, parts cleaning, brake shoe changes, and other minor repairs. It contains a parts cleaner and several drums of motor oil, antifreeze, and brake fluid. Waste material is stored in drums outside the motor pool (AREE 12). There are no drains in the maintenance shop; however, there is a work pit that has an approximately 3 feet by 2 feet by 3 feet deep concrete pit for collection of oil. This pit, which does not have a drain, was formerly emptied by pumping the contents to a drum. The work pit has not been used for changing oil since 1988. Oil is currently drained into pans, which are emptied into the waste drums (AREE 12) (Allen, 1991).

3.5 WASTE HANDLING AREAS

3.5.1 ACID NEUTRALIZATION TANK (AREE 13)

An acid neutralization tank is located west of Building 211 in the inner fenced compound (Photograph 12). This tank is located adjacent to a battery room in Building 211 and was installed when Building 211 was constructed (in 1979) to contain any spills in the battery room (Allen, 1991).

The battery room is used for storage and charging of small lead/acid batteries similar to automobile and truck batteries. At the time of the site visit, there were approximately 20 batteries in the room. The room has a concrete floor and a safety shower. Spills or shower water will drain into the acid neutralization tank through the

floor drain. The drain is not believed to have been used for disposal of battery acid on a routine basis.

The acid neutralization tank is an approximately 1,000-gallon concrete underground sump. The tank drains to the sanitary sewer but is large enough to contain expected spills. It does not contain neutralizing chemicals, although twice a year an outside contractor adds a neutralizing chemical and flushes the tank with water. There have been no significant spills reported in the battery room (Allen, 1991).

3.5.2 FORMER INCINERATOR (AREE 20)

A small incinerator in the south area of the fenced compound was used for burning classified documents from the 1950s until 1970. It was removed in 1972. The incinerator was a metal box approximately 8 feet by 5 feet by 6 feet high. It had asbestos lining between inner and outer metal walls, a dust collector in the smoke stack to prevent release of ash out the stack, and a 100-gallon aboveground tank for heating oil, which was used as a fire starter. The unit was mounted on a concrete base.

The incinerator was used frequently, sometimes daily. The ash was shoveled into drums and was disposed of at one of the on-site landfills. When the incinerator was dismantled, it was disposed of in Landfill No. 1 (Allen, 1991).

3.5.3 SEWAGE INJECTION AREA (AREE 25)

In 1974, sanitary sewage sludge was injected into the ground throughout the northern part of the facility. This practice was stopped after complaints from neighbors. The sludge was obtained from the Occoquan Sanitary District near Woodbridge and the Blue Plains sanitary treatment plant in Washington, DC. It was injected into the ground during a 4-month period from September to December 1974. A letter from that period stated that 20,000 gallons per day was injected 18 inches into the soil (Appendix E). Analyses of the sludge were not obtained, but only municipal sanitary sewage was reportedly processed at these plants (Eckley, 1991). Sludge injection is a common practice and generally does not cause contamination, unless the sewage has metals or other toxic compounds from industrial or other sources.

3.6 STORAGE AREA

3.6.1 FLAMMABLE/BATTERY STORAGE (AREE 18)

A small two-room concrete structure (Building 204) in the southwest corner of the fenced compound is used to store flammable materials and vehicle batteries. The western room is a flammables storage room and currently contains two 55-gallon drums, and the eastern room contains vehicle batteries.

The flammable storage room has a concrete floor with no drain and no curb at the door. The battery room has a concrete floor with a safety shower and drain in one corner. The shower does not have a curb, so acid spillage could flow into the drain. It is not

known where the drain discharges. There are no drainage lines from this building indicated on the sanitary sewer or storm sewer maps, and there were no visible drain openings.

The flammable storage room currently contains two 55-gallon drums. It is not certain when the drums where placed there. A waste oil recycling company, Eastern Oil Co., analyzed the contents for pH, PCBs, chlorinated solvents, flash point, water content, and percent solids. Eastern Oil reported that one drum contained only oil and could be recycled, but the other contained a chlorinated solvent and was not acceptable for recycling. The contents of this second drum were analyzed at Harry Diamond Lab in Adelphi and determined to contain mixed xylenes that are not chlorinated.

The waste oil drum will be taken by Eastern Oil for use in a fuel blending operation at its asphalt batching plant. At the time of the site visit, it was not known when that would occur. The other drum must be disposed of as a hazardous waste. Arrangements for disposal had not been made at the time of the site visit (Feustle, 1991).

3.6.2 DRUM STORAGE AREA (AREE 12)

The paved area north of Building 202 (AREE 10) is currently used for storing drums of waste liquids such as motor oil, antifreeze, brake fluid, and cleaning solvent (Photograph 13). Generally, there are about two to three drums located at the site at any time. Approximately three to four drums a year are picked up by Harry Diamond Labs at Adelphi for disposal (Allen, 1991).

The drums are located on uncurbed flat pavement. There are drains in the pavement that empty into the oil/water separator (AREE 11), but it is possible that a spill in this area would flow off the pavement to the surrounding grassy area. There are many stains on the pavement and the surrounding soil. These stains may be from past oil spills (see Subsection 3.13).

3.6.3 THERMAL BATTERY STORAGE (AREE 19)

Thermal batteries are stored in two metal transport containers in a grassy area next to the flammable storage building. The facility is currently attempting to dispose of these batteries, which contain cadmium and asbestos (Appendix F).

Thermal batteries are used to activate fuse components in particular Army missiles and mortars. The active components of the batteries are sealed in metal cans and are not believed to be leaking. The batteries contain an electrolyte of lithium chloride and potassium chloride, a cathode of calcium chromate or potassium chromate, and an anode of solid calcium. The batteries also contain a pyrotechnic heat source consisting of powdered zirconium and an ignitor such as a heated wire or a percussion primer. In addition, the batteries contain asbestos as an insulating material. The presence of chromium and asbestos as well as the ignitability of the batteries may make them a hazardous waste.

There are a total of over 13,000 batteries weighing approximately 8,800 pounds. A detailed breakdown of material quantities is contained in Appendix F.

At the time of the site visit, a disposal company willing to accept the waste batteries had not been found. The facility sent a letter to the Commonwealth of Virginia's Department of Waste Management declaring the batteries as waste on 23 April 1991 (Appendix F).

There is no evidence that any material is corroded or leaking from the transporters. The fact that the batteries are hermetically sealed in metal cans makes it unlikely that there were releases from these batteries in the past.

3.6.4 FORMER STORAGE AREA (AREE 21)

An area to the east of Building 211 was used as a storage yard before Building 211 was built. Review of aerial photographs from 1962 to 1975 indicated what appear to be vehicles or metal storage boxes (EPIC, 1991). Reportedly, the transformers and capacitors containing PCBs that were disposed of in Landfill No. 2 (AREE 2) were stored at this site prior to disposal. According to a site map for that time, the area was paved, although it is not known whether the transformers were stored on the pavement or on the surrounding grassy soil. At present, the area not covered by Building 211 is mostly grass (Allen, 1991).

3.7 TEST AREAS

3.7.1 BURIED WIRE (AREE 27)

In the early 1950s, electrical cable was buried throughout the facility as part of an antenna for a worldwide communication system. The antenna system was used until 1970. Subsequent tests have used buried cable to a lesser extent. The cable consists of a copper wire in the center surrounded by a metal shield that contains copper, aluminum, or stainless steel, which is encased in a plastic outer coating. A limited amount of cable may have had a shield that contains lead. Some of the cable has been dug up since 1970 during excavations, but most of it remains in the ground. Pieces of the cable are visible on the surface throughout the facility (Photograph 14) (Allen, 1991; Reyser, 1991). Considering the date of installation, it is possible that some of the buried cable could contain PCB-impregnated insulation material.

3.7.2 BURIED ANTIFREEZE IN HOSES (AREE 26)

Antifreeze in plastic hoses was buried in the ground south of Building 306 as a test of a personnel intrusion and detection system. The antifreeze, which consisted mainly of ethylene glycol, was put in neoprene rubber hoses, which were cut to length, plugged at one end, filled with fluid, and sealed at the other end. The tubes were then buried at a depth of 1 feet to 3 feet. The tubes were placed from 6 to 20 feet apart in a random pattern over a square area approximately 2,000 feet on a side. The neoprene rubber hose varied from 3/4 inch to 2 inches in diameter. The hose is uncovered from

time to time during excavations in the area. When it is uncovered, it generally still contains antifreeze, which usually leaks from the hose into the ground during the excavation process. Most of the hose is still in the ground (Allen, 1991).

3.7.3 SALT IN SOIL TEST AREAS (AREE 9)

Small amounts of calcium chloride salt were mixed in soil as part of a number of tests. The salt was added to the soil to increase conductivity so that better electrical grounding could be achieved. Reportedly, 50 to 100 pounds of salt was placed in the soil and was left there after the tests were completed. This was apparently a common practice, as it was done in a number of instances at different locations. The soil and salt mixture was excavated after one of the tests and sent to Ft. Belvoir for disposal (Allen, 1991; Reyser, 1991).

3.8 UNDERGROUND STORAGE TANKS

There are six existing underground storage tanks (USTs) on WRF, and six tanks have been removed in the last 10 years. Important characteristics of the tanks are summarized in Tables 3-2 and 3-3. Additional details are provided in the following two subsections. Supporting documents are provided in Appendix G.

3.8.1 FORMER UNDERGROUND STORAGE TANKS (AREE 23)

WRF is currently conducting a program of leak testing USTs and removing those tanks that fail the test. So far, six tanks have been removed. The last one to be removed was a 1,000-gallon fuel oil tank near the guardhouse (Building 101). This tank failed a leak test on 7 January 1991 and was removed from the ground on 11 September 1991. A small hole was detected along the lower side of the tank (Photographs 15, 16), and an odor of petroleum hydrocarbons was detected in the soil. A soil sample was taken, and the analytical results showed that TPH was 230 ppm and BTXE was non-detect. The Virginia Water Control Board guidance requires remedial action if the TPH is greater than 100 ppm. The facility has requested permission from the Virginia Water Control Board to perform additional excavation of contaminated soil, which is scheduled to be taken to Envirotech for incineration. The estimated volume of additional soil to be excavated is 10 cubic yards (Feustle, 1991).

Three 10,000-gallon USTs were removed from near Building 202. These USTs are discussed in Subsection 3.3.

A 1,000-gallon steel gasoline UST located near Building 202 failed a leak test in November 1989 and was removed in 1990. A soil sample was analyzed for TPH and found to contain less than 25 mg/kg. This tank was replaced by a new 1,000-gallon fiberglass tank (see Subsection 3.7.2). Two monitoring wells were installed with the new tank so that groundwater samples could be taken if a leak was suspected in the new tank; however, no water samples have been taken since the tank was installed (Feustle, 1991).

Table 3-2

Former Underground Storage Tanks

Located Near Building	Construction	Capacity (gallons)	Contents	Date Installed	Date Removed	Leak Tested	Passed Test
101	Steel	1,000	#2 fuel oil	1966	1991	Yes	No
202	Steel	10,000	#2 fuel oil	1966	1990	Yes	No
202	Steel	10,000	#2 fuel oil	1966	1990	Yes	No
202	Steel	10,000	Diesel	--	1981	No	--
202	Steel	1,000	Gasoline	--	1990	Yes	No
203	Steel	2,000	#2 fuel oil	1966	1986 or 1987	No	--

Table 3-3

Existing Underground Storage Tanks

Located Near Building	Construction	Capacity (gallons)	Contents	Date Installed	Leak Tested	Passed Test
202	Fiberglass	2,000	Diesel	1981	No	--
202	Fiberglass	1,000	Gasoline	1990	Yes	Yes
203	Steel	10,000	#2 fuel oil	1966	Yes	Yes
211	Steel	1,500	#2 fuel oil	1976	No	--
306	Steel	300	#2 fuel oil	1976	No	--
306	Steel	300	Diesel	1976	No	--

A 2,000-gallon steel heating oil UST was removed from the ground near Building 203 in 1986 or 1987. No information on sample results is available (Feustle, 1991).

3.8.2 EXISTING UNDERGROUND STORAGE TANKS (AREE 24)

Of the six existing USTs, two have been leak-tested and have passed the test. The remaining tanks will be leak-tested within the next 2 years. The existing tanks include one new fiberglass tank, one fiberglass tank installed in 1981, and four steel tanks installed between 1966 and 1976. The new tank, a 1,000-gallon tank for gasoline, is double-wall fiberglass with fiberglass piping. Two groundwater monitoring wells were installed along with the tank for use if a leak is suspected; however, these wells have not been sampled since they were installed. The other fiberglass tank is of unknown construction and has coated steel piping, and the steel tanks are either painted or asphalt-coated, with coated steel piping (Feustle, 1991).

3.9 TRANSFORMERS (AREE 15)

There are eight transformers at WRF. They were tested for PCBs in July and August 1990. Seven of the eight had less than 10 ppm PCB, while the other transformer had 565,800 ppm PCB. It was determined to be Aroclor 1260 in Pyranol oil. The results are summarized in Table 3-4 and reproduced in Appendix D (Roudebush, 1990). The PCB transformer is located outside at the northeast corner of Building 201 on a fenced concrete pad (Photograph 17). It is the only transformer at that location, but attached to it is an electrical switch containing 65 gallons of pyranol. The manufacturer has stated that this type of oil consists of 50 to 60% PCB. Therefore, although the contents of the switch have not been tested, the switch is labeled as containing PCB. The concrete pad is uncurbed but does not show any indication of leakage.

3.10 OIL/WATER SEPARATORS (AREEs 11, 14)

There are two oil/water separators at WRF, one north of Building 202 and one north of Building 211. Both are approximately 1,000-gallon concrete tanks. The tanks are currently emptied twice a year by an outside contractor, and the contents are disposed of off-site (Allen, 1991).

The oil/water separator near Building 202 receives drainage from the paved area north of Building 202 and from a wash rack in the same area. Photographs 18 and 19 show the separator between the four metal poles. It discharges to the grassy area outside the fenced compound. About 5 years ago, the wash rack was plugged and washing of vehicles on-site was prohibited. The other drains have not been plugged. Photograph 20 shows the ditch in the grassy area into which the separator discharges. Photograph 21 is a close-up of the discharge.

Aerial photographs for 1962, 1963, and 1964 (USEPA, 1991) indicate possible stains and possible wet soil north of the wash rack. Reportedly, the oil/water separator was

Table 3-4

Results of PCB Testing at Woodbridge

Sample ID	Room	Serial No.	Gallons	Oil Type	PCBs in PPM	PCB Type
Building 101						
HDL-50 WB	Pole				9	Aroclor 1254
Building 201						
HDL-44 WB	Outside	43738	376	Mineral Oil	4	Aroclor 1254
HDL-43 WB	Outside	43737	376	Mineral Oil	5	Aroclor 1254
HDL-45 WB	Outside	F693736	210	Pyranol	565,800	Aroclor 1260
Building 211						
HDL-46 WB	Outside	M586235TJPA	96	Mineral Oil		None detected
HDL-47 WB	Outside	M322304TJPA	130	Mineral Oil		None detected
Building 306						
HDL-49 WB	Outside	M322167TJPA	93	Mineral Oil		None detected
Field Building						
HDL-48 WB	Outside	81ZD54A001	96	Mineral Oil		None detected

not built until the mid-1970s. It is possible that the stains or wet soil were caused by vehicle washing or other wet activities that may have involved oil-contaminated water.

The oil/water separator north of Building 211 receives drainage from the work areas inside Building 211. Its purpose is to collect spills in the building. It discharges to the grassy area to the east of the fenced compound. There have been no spills reported in Building 211, and no significant amounts of hazardous liquids are believed to have been handled there (Allen, 1991).

3.11 ASBESTOS (AREE 16)

HDL personnel completed asbestos inspections and abatement activities during the 1980s to remove all friable asbestos-containing materials (ACM) within buildings at the facility. All ACM from domestic hot water lines, steam lines, and pipe elbows was reportedly abated. Additionally, trowelled-on plaster that contained asbestos was removed (Rock, 1991). Some ACM may still be present in the facility, including floor tiles and associated mastic, mastic on ceiling tiles, and ACM debris that is possibly buried in ravines or landfills on the facility.

During the site reconnaissance, a number of materials were identified as suspect ACM, including 9-inch by 9-inch floor tiles (in all buildings), pipe insulation on boiler pipes in Building 211 (Photographs 22 and 23), and fire door insulation in Building 201. Additionally, suspect ACM pipe insulation was identified in Landfill No. 1, as shown in Photograph 3.

According to contract documents dated 29 September 1990, sampling and subsequent ACM abatement were performed in Buildings 201,202, and 203 by Capitol Contractors, Inc. Asbestos-containing pipe insulation, lagging, debris on underlying ceiling tiles, and wall board were identified and subsequently abated from Buildings 201,202, and 203. Suspect ceiling tile was also sampled and analyzed and found not to be ACM. ACM floortile was found in Building 203, but there was no record of it having been abated.

3.12 DRAINAGE DITCH (AREE 22)

The drainage ditch that runs to the north and east of the fenced compound may have received contaminated runoff from the wash rack and oil/water separators (AREE 11) and the various oil spills (AREEs 8 and 17). Aerial photographs from the 1960s indicate possible stains and wet soil near the drainage ditch (USEPA, 1991).

Tires, cans, and bottles were observed during the site visit alongside the ditch where it enters the facility along the northern boundary. This debris appears to have washed onto the facility.

3.13 SPILL AREAS (AREE 17)

There have been two recent oil spills and several known spills that occurred in the 1970s or early 1980s. The two recent spills involved releases from the hydraulic

systems of an overhead crane and a bulldozer. The other known releases were caused by overfilling of oil USTs near Building 202 (see Subsection 3.4).

One of the recent spills occurred in April 1989, when a check valve was left open on a crane's hydraulic system, and approximately 100 to 150 gallons of No. 20 hydraulic oil leaked onto the soil north of Building 202. Approximately 40 to 60 tons of contaminated soil was excavated and placed on absorbent blankets. The second spill occurred in January 1990, when approximately 100 gallons of water-contaminated diesel fuel was drained from a bulldozer in an area to the west of the fenced compound. Photograph 24 looks south towards the general area. Approximately 100 tons of contaminated soil was excavated and placed on absorbent material over plastic sheeting. In both cases, all visibly stained soil was removed. There was no sampling of the non-stained soil, but because of the quick remedial action, it is unlikely that any significant residual contamination remains. Both piles of soil were taken off-site by Spill Safe Testing, and the soil was incinerated in 1990 (Feustle, 1991).

SECTION 4

HUMAN AND ENVIRONMENTAL RECEPTORS

4.1 RELEASES TO SURFACE WATER AND SEDIMENTS

Surface water analyses conducted in 1984 and 1985 in the southwestern part of the facility indicated no detectable surface water contamination.

Possible contaminant releases to surface water impoundments, creeks, and stormwater collection systems resulted from overland flow over parking, maintenance, and outdoor storage areas. Probable contaminants include spilled fuels, oil, lubricants, metals, and PCBs. These contaminants may also enter the surface water system attached to eroded soil or resuspended sediments. Off-site impacts may include surface water contamination for private industrial activities north of WRF.

All surface water drainage from WRF eventually drains into Marumsco Creek and Occoquan Bay, with the exception of a small area in the northeast where surface water may flow to Belmont Bay. This large drainage system provides habitat for aquatic wildlife, which are consumed by wildlife predators, domestic animals, and humans.

Sediments and soils that have been eroded and redeposited within streams are a special case. Because surface soil is most likely to be both eroded and contaminated, higher concentrations of some persistent contaminant by-products are likely to be found in sediments. Persistent contaminants that have been detected in landfill and surface soils include PCBs and petroleum compounds.

Sediments provide habitat to a variety of aquatic organisms, hence the potential for bioaccumulation farther up the food chain. Sediments are also a potential source of contamination to off-site surface water, either through leaching within effluent streams or resuspension.

4.2 RELEASES TO SOILS

Potential sources of soil contamination include:

- Surface/subsurface soil contaminated with PCB compounds and metals associated with storage, handling, and disposal sites, and subsequent downward leaching into the subsoil.

- Subsurface soil contaminated with petroleum-based fuels and solvents from leaking USTs.

Depending on contaminant levels, these soils could pose an inhalation or direct contact exposure risk to personnel working in or around them.

4.3 RELEASES TO GROUNDWATER

Potential sources of groundwater contamination at the facility include:

- Leaching of PCB compounds from soils near former uncontrolled landfills, storage and handling areas, and from current and past PCB transformer locations.
- Inadequate isolation of leachate from landfills and storage areas that contain unknown materials.
- Migration of free petroleum product and petroleum contaminants present in sediments from three known spill areas.
- Leaking underground storage tanks (USTs) and former UST leakage sites.
- Heavy metals contamination caused by leaching of wires and cables located throughout the facility.
- Release of ethylene glycol from buried rubber pipes in ground.
- Release of petroleum products through operation of oil/water separators.
- Potential metals contamination from former temporary practice of injecting sewage sludge into ground.

Groundwater flow at WRF follows topography towards, and discharges into, Marumsco Creek in the southwest, Occoquan Bay in the east and southeast, and into Belmont Bay in the northeast.

There are three shallow water wells on the facility, which are not currently used.

4.4 RELEASES TO AIR

Ongoing sources of possible air contamination include four heating boilers and several propane heaters in portable trailers on WRF. Emissions from these sources create no significant impact on ambient air quality.

Potential sources of air contamination include asbestos and lead. Primary receptors of potential asbestos exposure would be inhalation by humans occupying any building containing asbestos-containing materials (ACM) or lead-based materials. This would include any office workers, maintenance personnel, and any remediation or demolition workers. It should be noted, however, that any building containing ACM or lead-based materials would require removal of such materials prior to any demolition activities.

SECTION 5

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER ACTION

The AREEs identified at Woodbridge Research Facility and recommendations for further action are summarized in Figure 5-1 and Table 5-1. A summary of findings and recommendations for further action for each AREE are discussed in the following subsections.

5.1 LANDFILLS

There are five known and two potential landfills on WRF. These landfills have not been used since 1973, but they have never been closed in accordance with Commonwealth of Virginia regulations. The Virginia Department of Waste Management categorizes landfills as sanitary, construction/demolition/debris, or industrial. The landfills at WRF may fit the construction/demolition/debris category. The Virginia regulations may require a formal closure for landfills of this type (VDWM, 1989). The closure process includes a phased sampling scheme. Phase I sampling requires analysis for the parameters listed in Table 5-2. If the results of the Phase I sampling exceed regulatory limits, then Phase II sampling is required. The Phase II parameters are also given in Table 5-2.

5.1.1 LANDFILL NO. 1 (AREE 1)

Landfill No. 1 is located next to Occoquan Bay. It was closed in 1973 after operating for an undetermined period. The landfill was used as a dumping site for construction debris including concrete, scrap metal, asphalt, wire, and pipe. Potential asbestos-containing materials were observed during the site visit. The landfill area was used as a firing range during the 1950s and 1960s.

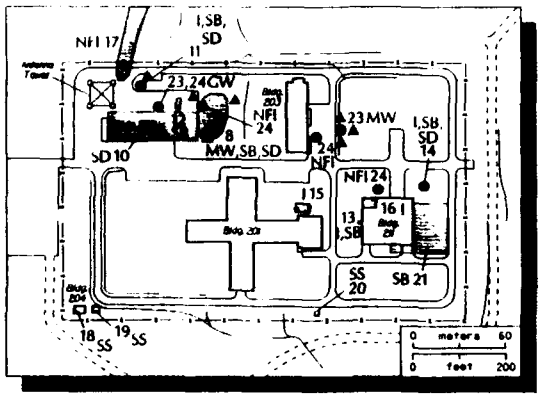
As discussed in Section 3.1.1, six monitoring wells were installed around the landfill in 1985 to monitor PCBs in groundwater. Samples have been taken from these wells annually and analyzed for PCBs. No detectable amounts of PCBs have been found in the samples.

Although there is no record of materials disposed of at the landfill, there is a potential, because of its long use, that hazardous materials were disposed of at this site. A comprehensive sampling program is therefore recommended.

Samples should be taken from the six existing monitoring wells and analyzed for TAL metals, PCBs, total petroleum hydrocarbons (TPH), volatile organic compounds (VOC), and total base/neutral/acid extractable compounds (BNA). These tests contain all of the Virginia Phase I and Phase II parameters. Samples should be taken from potential asbestos-containing material (ACM) on the surface and analyzed for asbestos.

U. S. Army
Base Closure Preliminary Assessment
Woodbridge Research Facility
Woodbridge, VA – December 1991

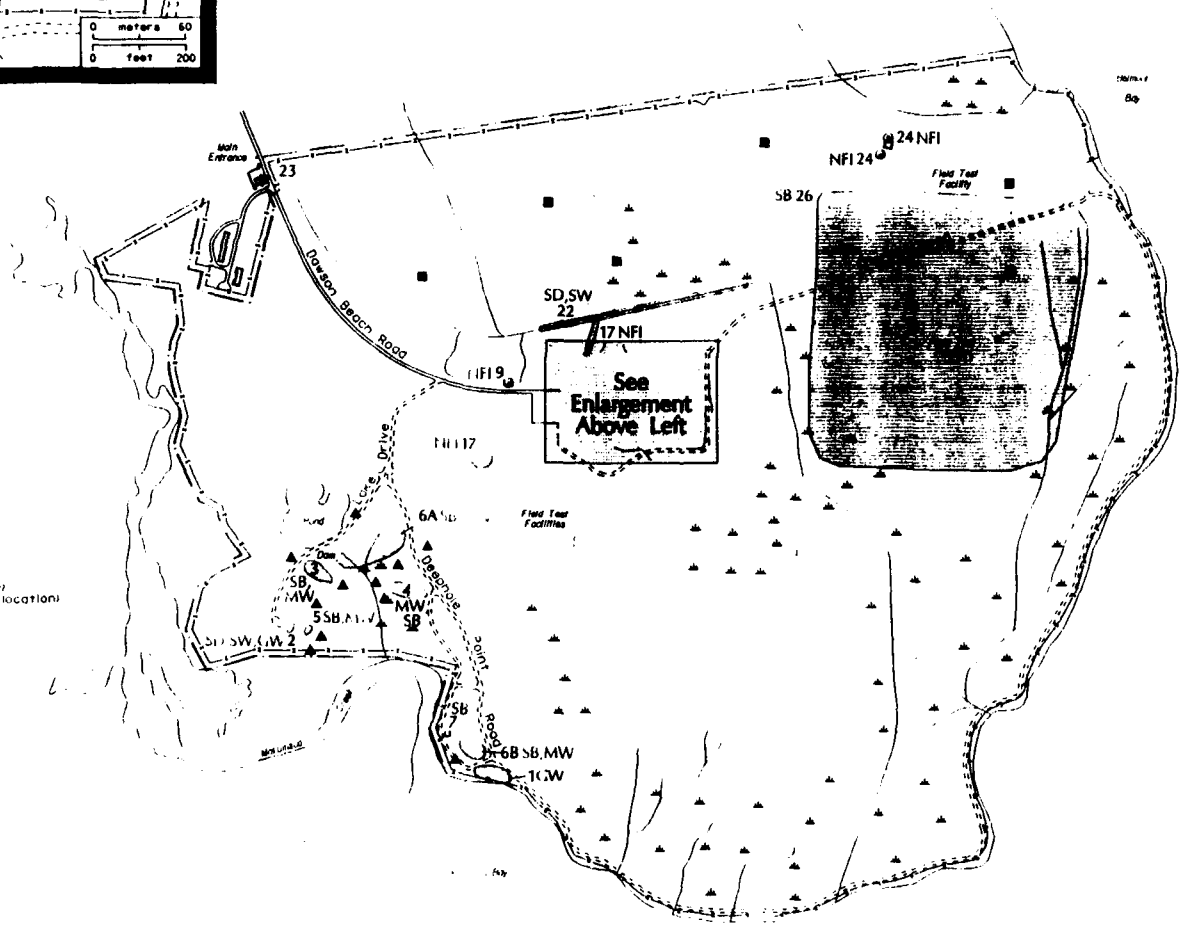
Figure 5-1
Recommended Sampling Locations



Installation Boundary
Hydrography
Road/Pavement Edge
Gravel Edge
Railroad
Powerline
Pipeline
Fence
Structure

Compiled in 1991 from various sources provided by the U.S. Army Toxic and Hazardous Materials Agency

0 meters 200
0 feet 800



1. Landfill Number 1
2. Landfill Number 2
3. Landfill
4. Landfill
5. Landfill
6. Potential Landfill (2 Locations)
7. Pistol Range
8. UST Leaks and Spills
9. Salt In Soil Test Area
10. Maintenance Shop
11. Oil/Water Separator
12. Drum Storage Area
13. Acid Neutralization Tank
14. Oil/Water Separator
15. Transformer
16. Asbestos In Buildings
17. Oil Spill Areas (2 Locations)
18. Flammable Storage
19. Thermal Battery Storage
20. Former Incinerator
21. Former Storage Area
22. Drainage Ditch
23. Former Underground Storage Tanks
24. Underground Storage Tanks
25. Sewage Spreading Area (not shown throughout northern part of facility)
26. Buried Antifreeze Pipes (approximate location)
27. Buried Wire (throughout facility)
28. Radon (not shown)

GW	Groundwater
I	Inspect Area: Recommendations Based On Findings
MW	Monitoring Well
NFI	No Further Investigation Needed At This Time
SB	Soil Boring
SD	Sediment
SW	Surface Water

■	Proposed Soil Boring For Injected Sewage
▲	Proposed Monitoring Well
24	AREE Number
●	AREE

US Army Corps of Engineers
Toxic and Hazardous Materials Agency

Table 5-1

AREEs Identified at Woodbridge and Recommendations for Further Action

AREE No.	Description	Summary of Findings	Concern	Recommended Activity	Analyses
1	Landfill No. 1	Landfill contains metal, wire, concrete, wood, rubber tires, possible electrical capacitors. Covered with soil. Operated 1950s - 1973.	Metals, PCBs, Petroleum products, Asbestos.	Sample existing wells. Sample surface debris.	TAL Metals, PCBss, TPH, VOC, BNA, Asbestos.
2	Landfill No. 2	Landfill contained metal debris, wire, wood, misc. refuse, capacitors and transformers containing PCBs. Capped with soil in 1973. Excavated in 1984. Contaminated material taken to H.M. Landfill.	PCBs, metals, petroleum products.	Sample existing wells. Sample sediment and surface water in wetlands area.	TAL Metals, PCBss, TPH, VOC, BNA.
3	Landfill No. 3	Landfill contains lead-containing wire, paper, plastic, wood. Covered with soil in 1973.	Metals, PCBs, petroleum products.	Install three soil boring/ monitoring wells; soil and GW sampling.	TAL Metals, PCBss, TPH, VOC, BNA.
4	Landfill No. 4	Landfill contains wire, trash, empty oil drums. Covered with soil in 1973. Operated 1950s - 1973.	Metals, PCBs, petroleum products.	Install three soil boring/ monitoring wells; soil and GW sampling.	TAL Metals, PCBss, TPH, VOC, BNA.
5	Landfill No. 5	Landfill contains metal debris. Was covered before 1970.	Metals, PCBs, petroleum products.	Install two soil boring/monitoring wells; soil and GW sampling.	TAL Metals, PCBs, TPH, VOC, BNA.
6-A	Potential Landfill	Aerial photos indicate disturbance in 1960s and 1970s.	Metals, PCBs, petroleum products.	Install three soil boring/ monitoring wells; soil and GW sampling.	TAL Metals, PCBss, TPH, VOC, BNA.
6-B	Potential Landfill	Aerial photos indicate soil disturbance in 1960s and 1970s.	Metals, PCBs, petroleum products.	Install one soil boring/monitoring well; soil and GW sampling.	TAL Metals, PCBs, TPH, VOC, BNA.
7	Pistol Range	Rounds fired into soil bank. Covered with soil in 1982.	Lead.	Two soil borings 0 to 4 feet in bank and two soil borings 0-4 feet in firing-line area; visually inspect for rounds.	None.
8	UST Leaks and Spills	Area contained three 10,000 gallon USTs, which were removed after leaking. Several major soil spills during UST filling and oil transfers. Oil leaking into pit in nearby maintenance shop.	Petroleum Products.	Install three soil boring/ monitoring wells; soil and GW sampling. Sample sediment and liquid in condensate return pit in maintenance shop.	TPH.

Table 5-1

AREEs Identified at Woodbridge and Recommendations for Further Action (continued)

AREE No.	Description	Summary of Findings	Concern	Recommended Activity	Analyses
9	Salt in Soil Test Area	Calcium chloride mixed in soil for test at several locations. Salt mixture was removed in one case and sent to Ft. Belvoir.	Calcium chloride.	None.	None.
10	Maintenance Shop (Bldg. 202)	Vehicle maintenance Bldg. Has no drains to the outside.	Petroleum products, VOC, BNA.	None.	None.
11	Oil/Water Separator	Waste oils from motor pool emptied into drains which ran to O/W separator. Water discharged to grounds. Also vehicle Wash Rack drained to O/W separate Wash Rack drain plugged in 1990.	Petroleum products, VOC, BNA.	Inspect tank for leaks, if leaks are found, install soil boring/monitoring well; sample outfall: soil boring 0-4 feet; sample sediment in bottom of tank.	TPH, VOC, BNA.
12	Drum Storage Area	Waste drums stored on pavement north of maintenance shop contain waste oil, paints, cleaning solvents, antifreeze, brake fluid are sent to Adelphi periodically.	Petroleum products, VOC,BNA.	Two borings in asphalt or at edge of pavement; sample at 2-3 feet.	TPH, VOC, BNA.
13	Acid Neutralization Tank	UST connected to drain in battery storage room in Bldg. 211.	Acid, metals.	Inspect tank for leaks. Soil boring to 2 feet below tank. If pH < 6, take soil sample for analysis for metals.	pH.
14	Oil/Water Separator (Bldg. 211)	UST connected to drain in work area in Bldg. 211. Water drains to field east of bldg.	Petroleum products, VOC, BNA.	Inspect tank for leaks. Sample outfall; soil boring 0-4 feet. Sample sediment in bottom of tank.	TPH, VOC, BNA.
15	Transformer	Pad mounted transformer tested, contains 210 gallons transformer oil, 56% PCBs.	PCBs.	Inspect pad for leaks after transformer removal. If pad is stained, then remove chips and analyze for PCBs.	PCBs test if stained.
16	Asbestos	Old boiler removed but potential for asbestos in floor tiles, mastic, isolated pipe insulation, and fire doors.	Asbestos.	Do certification inspection for asbestos. Sample as necessary.	Asbestos.

Table 5-1

AREEs Identified at Woodbridge and Recommendations for Further Action (continued)

AREE No.	Description	Summary of Findings	Concern	Recommended Activity	Analyses
17	Spill Areas	Hydraulic fluid (oil) was spilled from a crane and a bulldozer at two locations. Remedial action was taken immediately.	Petroleum products.	None.	None.
18	Flammable/Battery Storage (Bldg. 204)	Storage bldg for drums and batteries. Has concrete floor. Current battery storage area has safety shower and drain.	Metals, VOC, BNA.	Dispose of drums. Surface soil sample (0-6") outside doors to rooms, determine where drain goes and sample out fall.	Lead, VOC, BNA.
19	Thermal Battery Storage	Metal container has thermal batteries.	Metals, asbestos.	Dispose of batteries and sample soil beneath containers 0-2 feet.	TAL Metals.
20	Former Incinerator	Metal box was used to burn paper during period 1950s to mid 1970s.	Metals.	Surface soil sample 0-2 feet visually inspect soil to confirm that only paper was burned.	None.
21	Former Storage Area	Site partially covered by present Bldg. 211. Reportedly stored transformers & capacitors in early 1970s.	PCBs, TPH.	Soil boring 0-4 feet in 4 places.	PCBs, TPH.
22	Drainage Ditch	Oil spills may have drained to ditch, contamination may have entered ditch from off-site.	Petroleum products.	Take a sediment sample and a water sample upstream and downstream of inner compound.	TPH.
23	Former Underground Storage Tanks	Six USTs have been removed, four as the result of failing leak tests conducted in 1990 and 1991, and two removed earlier after they were determined to be leaking.	Petroleum products.	Install three monitoring wells at UST near Bldg 203 that was removed in 1986; sample two wells that were installed with new gasoline UST near Bldg 202.	TPH.
24	Existing Underground Storage Tanks	Six USTs, of which two have been leak tested.	Petroleum products.	Continue program to leak test all USTs. Comply with UST regulations.	None.
25	Sewage Injection Area	Sewage sludge injected into ground at depth of 2 feet in 1974.	Metals.	Six soil borings to 3 feet - one sample from each boring.	TAL metals.

Table 5-1

AREEs Identified at Woodbridge and Recommendations for Further Action (continued)

AREE No.	Description	Summary of Findings	Concern	Recommended Activity	Analyses
26	Buried Antifreeze in Hoses	Ethylene glycol in rubber pipes in ground.	Ethylene glycol.	Remove pipes. Install soil borings.	Ethylene glycol by GCFID, direct injection for ethylene glycol.
27	Buried Wire	Metal and plastic wire buried in ground for tests could contain PCBs.	Lead, PCBs.	Remove samples of wire.	PCBs and, if cable is deteriorated, soils for PCBs and Metals.

Table 5-2

Virginia Sampling Parameters for Landfills

Phase I Parameters

- Hardness
- Sodium
- Chloride
- Iron
- Lead
- Specific Conductance
- pH
- TOC
- TOX

Phase II Parameters

Inorganic Constituents

- Arsenic
- Barium
- Cadmium
- Chromium
- Copper
- Cyanide
- Mercury
- Selenium
- Silver
- Zinc

Organic Constituents

- Acrylonitrile
- Aldrin
- Benzene
- Bis(2-chloroethyl) ether
- 2-Butanone(methyl ethyl ketone)
- Carbon disulfide
- Carbon tetrachloride
- Chlordane
- Chlorobenzene
- Nitrobenzene
- Pentachlorophenol
- Phenol
- Chloroform
- o-Cresol
- o-Dichlorobenzene
- p-Dichlorobenzene
- 1,2-Dichloroethane; Ethylene dichloride
- 1,1-Dichloroethylene
- trans-1,2-Dichloroethene
- Dieldrin
- 2,4-Dinitrotoluene
- Endrin
- Heptachlor/Heptachlor epoxide
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachloroethane
- Lindane
- Methylene chloride
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene; Perchloroethylene
- Toluene
- Toxaphene
- 1,1,1-Trichloroethane
- Methylchloroform
- 1,1,2-Trichloroethane
- Trichloroethene
- Trichloroethylene
- 2,4,6-Trichlorophenol
- Vinyl chloride

5.1.2 LANDFILL NO. 2 (AREE 2)

Landfill No. 2 was used as a disposal area for PCB-containing transformers and capacitors in the early 1970s. The contaminated debris was excavated and removed in 1985. Six monitoring wells were installed around the site of the landfill, and samples were taken annually and analyzed for PCBs. In 1990, PCB concentrations of up to 7 μg/L were found in the wells.

Although there is no record of materials disposed of at the landfill, there is a potential, because of its long use, that hazardous materials were disposed of at this site. A comprehensive sampling program is therefore recommended.

The six existing monitoring wells should be sampled and analyzed for TAL metals, PCBs, TPH, VOC, and BNA.

One surface water and two sediment samples should be taken in the swampy area around the unnamed creek that flows from the pond to Marumsco Creek and analyzed for TAL metals, PCBs, TPH, VOC, and BNA.

5.1.3 LANDFILL NO. 3 (AREE 3)

A landfill located east of the pond was used for disposal of wire, paper, plastic, and wood. It was used in the 1960s and 1970s and was covered with soil in 1973.

Although there is no record of materials disposed of at the landfill, there is a potential, because of its long use, that hazardous materials were disposed of at this site. Therefore, a comprehensive sampling program is recommended.

Three monitoring wells should be installed to groundwater depth. Two should be downgradient and one upgradient of the landfill. The wells should be sampled and analyzed for TAL metals, PCBs, TPH, VOC, and total BNA.

5.1.4 LANDFILL NO. 4 (AREE 4)

A landfill is located just south of Deephole Point Road, east of Shady Road. It was used for disposal of wire, trash, and empty oil drums from the 1950s until its closure in 1973, when it was covered with soil.

Although there is no record of materials disposed of at the landfill, there is a potential, because of its long use, that hazardous materials were disposed of at this site. A comprehensive sampling program is therefore recommended.

Three monitoring wells should be installed to groundwater depth. Two should be downgradient of the landfill and one should be upgradient. The wells should be sampled and analyzed for TAL metals, PCBs, TPH, VOC, and BNA.

5.1.5 LANDFILL NO. 5 (AREE 5)

A landfill is located near Landfill No. 2. It operated during the 1950s and 1960s and was closed before 1970. Metal debris is visible sticking out of a small mound of soil.

Although there is no record of materials disposed of at the landfill, there is a potential, because of its long use, that hazardous materials were disposed of at this site. A comprehensive sampling program is therefore recommended.

Two monitoring wells should be installed to groundwater depth. These two wells should be located downgradient of the landfill. The wells near Landfill No. 2 can serve as up-gradient wells.

The wells should be sampled and analyzed for TAL metals, PCBs, TPH, VOC, and BNA.

5.1.6 POTENTIAL LANDFILLS (AREE 6)

Two potential landfills (AREE 6A and AREE 6B) were identified from aerial photographs. Metal debris was observed on the ground during the site visit.

These two locations are partially covered by existing or proposed monitoring wells. The existing wells at Landfill No. 1 are to the south of the southern potential landfill (AREE 6B) and will partially monitor groundwater flow in that direction.

The monitoring wells proposed for AREEs 3 and 4 are not adequate to monitor the northern potential landfill (AREE 6A) although these areas are in close proximity. In order to allow for AREEs segregation and adequate monitoring, three wells (one upgradient and two downgradient) should be installed at AREE 6A.

Also, one additional monitoring well should be installed to the west of AREE 6B. All wells should be sampled and analyzed for TAL metals, PCBs, TPH, total VOC, and total BNA.

5.2 PISTOL RANGE (AREE 7)

Facility personnel used an embankment north of Landfill No. 1 as a pistol range during the 1970s. It reportedly was used only twice a year for qualification of facility personnel. The embankment was covered over with dirt during the early 1980s.

Two soil borings should be taken from the impact embankment and two from the firing line area to a depth of 4 feet and visually inspected for spent rounds. If spent projectiles are found, disposal of the affected soil in an approved landfill may have to be considered.

5.3 UST LEAKS AND SPILLS (AREE 8)

The soil and groundwater in the area east of Building 202 appear to have been contaminated with oil as a result of overfilling of USTs and/or leaking USTs at that location.

Reportedly, there were several oil spills around the three former 10,000-gallon USTs near the Maintenance Shop in the 1970s and early 1980s. These spills, which occurred during filling or transfer operations, may have involved up to several thousand gallons. The spills were contained with sand bags, and some soil may have been excavated and taken to Ft. Belvoir.

In addition, three 10,000-gallon USTs (two fuel oil and one diesel fuel) were removed from this location. The two fuel oil tanks were removed in 1990, and the diesel fuel tank was removed in 1981. The fuel oil tanks were removed in accordance with recent UST regulations and require no further action. There are no records of sampling during the removal of the diesel fuel tank.

Probably as a result of these spills and leaks, oil has seeped into a 15-foot-deep pit in the southeast corner of the Maintenance Shop (Building 202). The pit, which contains the condensate return tank, collects oil-contaminated water after a rain.

Three monitoring wells are recommended in the area of the three former USTs and in the spill areas. The monitoring wells should be installed to the northwest, northeast, and south of the USTs. Groundwater samples should be analyzed for TPH.

The liquid and bottom sediment in the condensate return tank pit should be sampled and analyzed for TPH.

5.4 MAINTENANCE SHOP (AREE 10)

The activities performed in the Maintenance Shop (Building 202) are vehicle maintenance, carpentry, and minor electrical repairs. Containers of fresh oil, cleaning solvent, paint, thinner, and battery acid are stored in this building. There are no drains to the outside. As mentioned in Subsection 5.3, the electrical switch room has a 15-foot-deep pit for the condensate return tank that fills with water and oil after a rain. No sampling is recommended other than the condensate return tank pit sampling discussed in Subsection 5.3.

5.5 WASTE HANDLING AREAS

5.5.1 ACID NEUTRALIZATION TANK (AREE 13)

A 1,000-gallon concrete underground tank is used to collect and neutralize any acid spilled from the battery room in Building 211. The tank drains to the sanitary sewer. Twice a year an outside contractor adds neutralizing chemical and flushes the tank with water. The tank should be inspected for cracks or evidence of leaks. A soil boring

should be taken to below the depth of the tank. Soil samples should be taken at 2-foot intervals and analyzed for pH to determine whether acid has been released from the tank. If the pH is less than 6, a soil sample should be analyzed for TAL metals.

5.5.2 FORMER INCINERATOR (AREE 20)

A small metal incinerator was used for burning classified documents from the 1950s until 1970 and was removed in 1972. The incinerator had asbestos-lined firewalls and a 100-gallon aboveground tank for heating oil that was used as a fire starter.

Six soil borings should be taken to 2 feet. The soil should be visually analyzed for evidence that something other than paper was burned, such as pieces of metal, or for evidence of organic stains. If visual evidence is found of material other than paper ash, the soil sample should be analyzed for TAL metals.

5.5.3 SEWAGE INJECTION AREA (AREE 25)

In 1974, sanitary sewage sludge from nearby municipal treatment plants was injected into the ground throughout the northern part of the facility. Reportedly, approximately 20,000 gallons per day was injected to a depth of 18 inches over a 4-month period. It is believed that the sewage was domestic waste and not industrial. Sludge injection is a common practice and generally does not cause contamination unless the sewage contains metals from industrial sources. However, because there is a potential for industrial sludge to have been disposed of at WRF, it is recommended that six soil borings be taken from the injection areas. One sample from each boring should be analyzed for TAL metals.

5.6 STORAGE AREA

5.6.1 FLAMMABLE/BATTERY STORAGE (AREE 18)

A two-room concrete building is used to store flammable waste and vehicle batteries. One room has two 55-gallon drums, one containing waste oil and the other mixed xylenes. This room has a concrete floor with no drain and no curb at the door. The other room contains batteries. It has a safety shower and an uncurbed drain that is believed to drain to the surrounding grounds. Because the doors to the exterior do not have a curb, it is possible that there may have been releases from the building to the outside in the past. Therefore, a surface soil sample should be taken at 0 to 6 inches outside each of the two doors and analyzed for TAL metals, VOC, and BNA. Additionally, an effort should be made to determine where the drain in the battery room discharges, perhaps by running water into the drain with a hose and looking for the outflow. When the exit point of the drain is found, another surface soil sample should be taken from 0 to 6 inches and analyzed for the same parameters as above.

Drums stored in this area should be managed in accordance with RCRA regulations regarding labeling and time requirements.

5.6.2 DRUM STORAGE AREA (AREE 12)

Waste liquid drums are stored on a paved area north of the maintenance shop (Building 202). There are generally two to three drums at any time, which contain waste liquids such as motor oil, antifreeze, brake fluid, and cleaning solvent. There are no curbs, and the pavement and surrounding grounds are stained and stressed. One soil boring in the grassy area to the north should be taken at the edge of the pavement. A sample at 2 to 3 feet should be analyzed for TAL metals, TPH, VOC, and BNA. It is likely that a small amount of soil contamination will be present at the location because of surface water runoff from the asphalt. Therefore, a small amount of contamination is not necessarily evidence of spills.

5.6.3 THERMAL BATTERY STORAGE (AREE 19)

Thermal batteries, which contain cadmium and asbestos, are stored in two metal containers. The batteries are hermetically sealed in metal cans, and there is no evidence that they are leaking. The facility is currently attempting to dispose of the batteries. After the batteries are removed, one soil sample should be taken beneath the containers at a depth of 0 to 6 inches and analyzed for TAL metals.

5.6.4 FORMER STORAGE AREA (AREE 21)

An area to the east of Building 211 was used as a storage yard before Building 211 was built. Reportedly, transformers and capacitors containing PCBs were stored in the area prior to disposal. Four soil borings should be taken to a depth of 4 feet and one soil sample should be taken from each boring and analyzed for PCBs and TPH.

The depth of the sample in each boring should be based on visual observation of the soil sample.

5.7 TEST AREAS

5.7.1 BURIED WIRE (AREE 27)

Electrical cable was buried in the ground throughout the facility for various purposes since the 1940s. Most of the cable is believed to be still in the ground. The cable contains copper, aluminum, stainless steel, and possibly lead. It is recommended that some of the cable be removed from the ground for inspection and chemical analysis. If the cable shows evidence of deterioration, soil samples should be taken and analyzed for TAL metals and PCBs, and the cable should be tested for PCBs.

5.7.2 BURIED ANTIFREEZE IN HOSES (AREE 26)

To test a personnel detection and intrusion system, rubber hose containing antifreeze (ethylene glycol) was buried near Building 306. The hoses were placed in an irregular pattern over a 2,000-foot by 2,000-foot area at a depth of 1 to 3 feet. It is believed that most of the hoses are still in the ground and still intact. Ethylene glycol is not a

RCRA-listed hazardous material. However, the apparent large amount of liquid antifreeze could result in local groundwater contamination if it is released in a short period of time. It is recommended that the hoses be removed, if that can be done practically without loss of antifreeze to the soil. Soil borings should be taken to a depth of 4 feet and analyzed for ethylene glycol by GCFID, by direct injection for ethylene glycol. The borings should be randomly placed at a density of one per acre.

5.7.3 SALT IN SOIL TEST AREAS (AREE 9)

Small amounts (50 to 100 pounds) of calcium chloride salt were mixed in the soil during tests to improve electrical grounding at a number of locations around the facility. In most cases, it is believed the salt was left in the soil after the test was completed. Calcium chloride is not a RCRA-listed hazardous material. No sampling is recommended.

5.8 UNDERGROUND STORAGE TANKS

5.8.1 FORMER UNDERGROUND STORAGE TANKS (AREE 23)

Six underground storage tanks have been removed at WRF because they were believed to be leaking or they failed a leak test. The two USTs suspected of leakage were removed before the present UST regulations were in place, and no soil samples were collected. The other four USTs have been removed since 1990 after failing leak tests, and soil samples from beneath the USTs were taken following excavation. The analysis of the samples indicated that TPH was less than 25 ppm for three of the tanks and 230 ppm for the tank that was recently removed from near the entrance guardhouse. The Virginia Water Control Board requires remedial action if the TPH is greater than 100 ppm. The facility plans to excavate approximately 10 cubic yards of soil at this location for incineration off-site to reduce the contaminant level to less than the state's limits.

The four USTs removed since 1990 were done in accordance with recent UST regulations. Therefore, no additional sampling is required, but it is recommended that the two monitoring wells that were installed with the new 1,000-gallon gasoline UST be sampled and analyzed for TPH and BTXE. However, there is no record of any sampling being done with the other two tanks and groundwater monitoring should be done. One tank was a 2,000-gallon heating oil UST east of Building 203, which was removed from the ground in 1986 or 1987. Three monitoring wells should be installed near the location of this UST and sampled for TPH.

A 10,000-gallon diesel oil UST at Building 202 was removed in 1981 after a leak was detected. Action items for this UST are covered in Subsection 5.4. This UST is in the UST leak and spill area discussed in Subsection 5.3, and the sampling recommended in that section is sufficient to monitor for contamination from this UST.

5.8.2 EXISTING UNDERGROUND STORAGE TANKS (AREE 24)

There are six existing USTs at WRF. Of these, two have been leak-tested and have passed the test. The remaining tanks will be leak-tested in the next 2 years. If this program is conducted and all UST regulations are complied with, then no additional sampling is recommended. The remaining tanks should be tested as soon as possible because several tanks have been tested and determined to be leaking.

5.9 TRANSFORMERS (AREE 15)

All transformers at WRF have been tested for PCB and one has been found to contain 56% PCB. The other seven transformers all contain oil with less than 10 ppm of PCB. The one transformer is located near Building 201 on a fenced concrete pad. Attached to it is an electrical switch that contains 65 gallons of pyranol. The manufacturers says that this oil typically contains 50 to 60% PCB. A contractor has been hired to remove the transformer and switch and replace them with new equipment. It is estimated that this will be done in mid-1992.

After the transformer is removed, the concrete pad should be inspected for signs of leaks. If stains are detected, chips of the stained concrete should be tested for PCBs.

5.10 OIL/WATER SEPARATORS (AREES 11 and 14)

There are two oil/water separators at WRF, one near the maintenance shop (AREE 11) and one near Building 211 (AREE 14). These approximately 1,000-gallon concrete tanks discharge through pipes to nearby grassy areas. The tanks are currently emptied twice a year by outside contractors and the contents disposed of off-site. The oil/water separator near the maintenance shop receives drainage from the paved area north of the building. It formerly received washwater from a nearby wash rack, but the wash rack was plugged several years ago and vehicles are no longer washed on site. The separator near Building 211 receives drainage from inside Building 211. It is not believed that significant amounts of contaminated liquid have entered the separator from Building 211.

Both oil/water separators should be inspected for leaks. If leaks are found, a soil boring/monitoring well should be installed. A soil boring should be installed to 4 feet at the outfall of the separators in the nearby grassy fields. One soil sample should be taken at each location and analyzed for TPH, VOC, and BNA. If there is sediment in the bottom of the separators, a sample should be taken and analyzed for the above parameters.

5.11 ASBESTOS (AREE 16)

Although much known asbestos has been removed, a comprehensive asbestos survey has not been conducted. During the site visit, potential asbestos-containing material was identified in floor tile, mastic, fire doors, and isolated sections of pipe insulation.

It is recommended that an asbestos survey be conducted and samples collected as necessary.

5.12 DRAINAGE DITCH (AREE 22)

A drainage ditch that enters WRF along the northern boundary and flows along the north and east sides of the inner fenced compound may have received contamination from the wash rack, the oil/water separators, various oil spills, and run-on from off-site properties to the north. Aerial photographs revealed possible stains and wet soil in the vicinity of the ditch during the 1960s, and tires and other debris were observed during the site visit.

It is recommended that a stream sediment sample and a surface water sample be taken upstream where the ditch enters the facility and downstream where it enters Occoquan Bay. The samples should be analyzed for TPH.

5.13 SPILL AREAS (AREE 17)

There have been two recent spills involving releases of hydraulic oil from an overhead crane and a bulldozer. In both cases, the stained soil was quickly excavated, placed on absorbent mats, and subsequently taken off-site for incineration. Because of the quick remedial action, it is unlikely that any residual contamination remains. Therefore, no sampling is recommended.

Spills associated with USTs near Building 202 are discussed in Subsection 5.4.

SECTION 6

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SECTION 7

PHOTOGRAPHS

1. LANDFILL NO. 1

2. DEBRIS IN LANDFILL NO.1

3. DEBRIS IN LANDFILL NO. 1

4. MONITORING WELL NEAR LANDFILL NO. 1

5. LANDFILL NO. 2

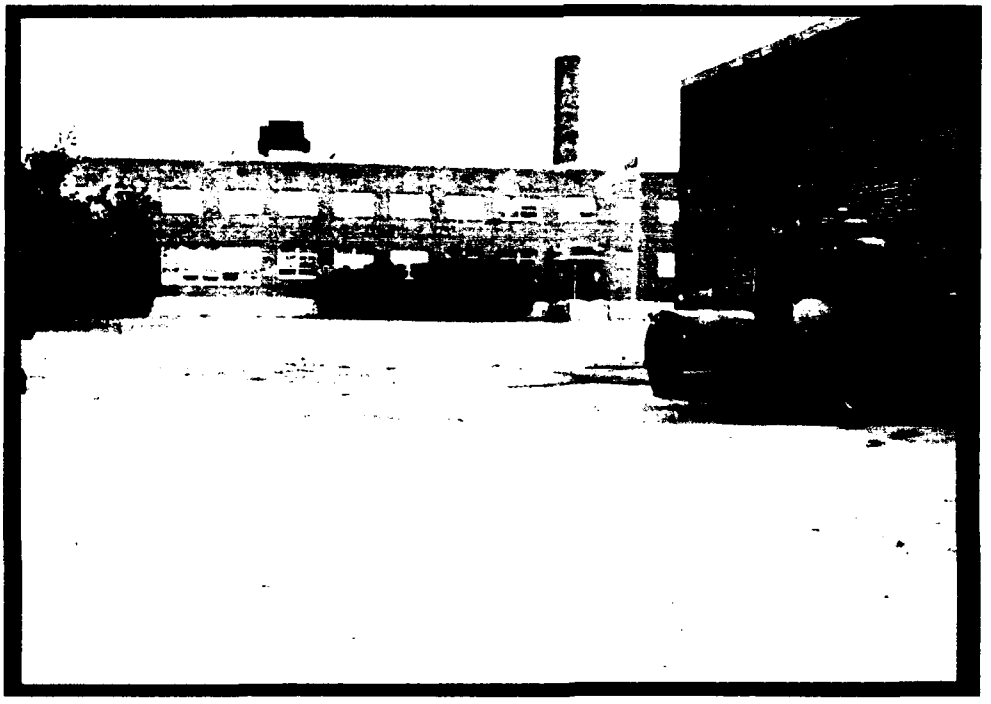
6. WELL NEAR LANDFILL NO. 2

7. WELL NEAR LANDFILL NO. 2

8. WELL NEAR LANDFILL NO. 2

9. DEBRIS IN LANDFILL (AREE 5)

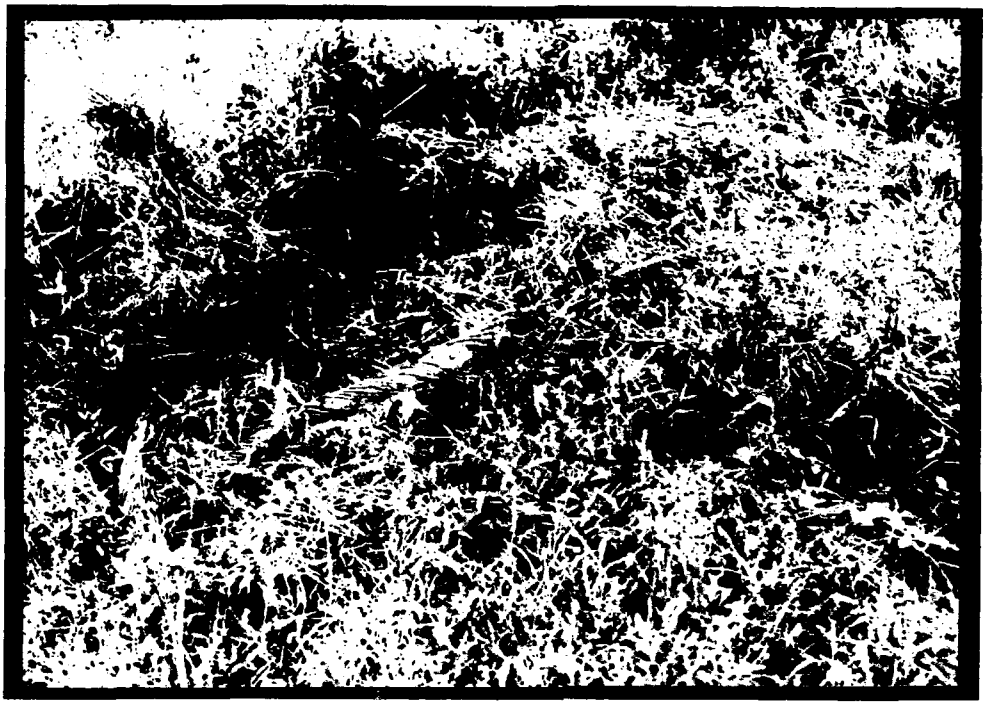
10. PISTOL RANGE



11. FIELD CONTAINING FORMER USTs

12. ACID NEUTRALIZATION TANK

13. DRUM STORAGE AREA



14. WIRE DEBRIS

15. EXCAVATED UST

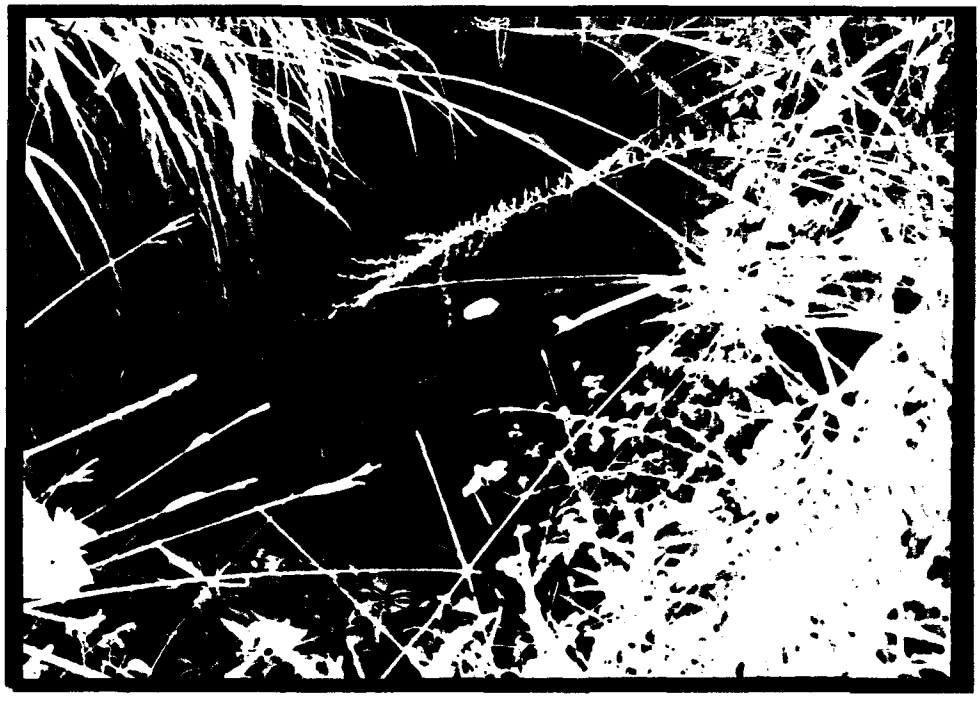
16. HOLE IN EXCAVATED UST

17. TRANSFORMER CONTAINING PCB

18. OIL/WATER SEPARATOR

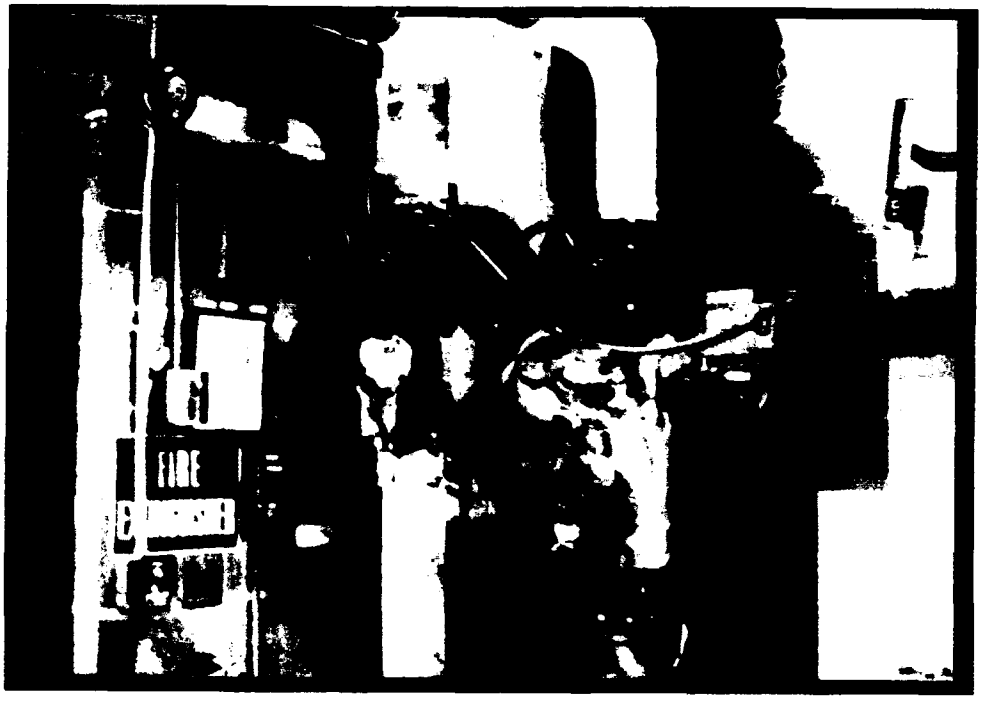
19. OIL/WATER SEPARATOR

20. DISCHARGE OF OIL/WATER SEPARATOR



21. CLOSE-UP OF DISCHARGE

22. NEW PIPE INSULATION



23. OLD PIPE INSULATION

24. VIEW TOWARDS SITE OF OIL SPILL

APPENDIX A

DATA SEARCH OUTPUT

SITE INFORMATION
DATA-SEARCH

Environmental Database, Inc.
2200 West Berry Avenue
Suite 4
Littleton, Colorado 80120
(303) 794-8389

This report is in no way to be taken as a declaration of the legal status of any property herein mentioned.

The information contained in this report has been gathered from government sources and was the latest available to us at compilation time. While every reasonable attempt has been made to ensure the accuracy of the information contained herein; it is understood that we cannot guarantee the accuracy of the information from the original sources, nor can we guarantee that no transcription or plotting errors have occurred.

For reports that contain maps it is understood that the purpose of these maps is to give the user a "working approximation" of the positions of reported site locations. Due to the level of accuracy for both the base maps themselves and the reported location information, these maps should not be used for purposes more correctly served by professional surveys.

Plotting of environmental information on our maps is dependent in part, on the accuracy of the street grid as represented in our map files. Should the client suspect the existence of, or during the field inspection should the client encounter, streets that are not shown on our maps, this should be brought to our attention to further improve the accuracy of the information contained in this report.

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Environmental Database Inc.
2200 West Berry Avenue - Suite #4
Littleton, Colorado 80120
(303) 794-8389

Roy F Weston, Inc.
Pembroke 2 287 Independence Blvd
Suite 113
Virginia Beach, VA
Attention: Jefferson Ghent

November 7, 1991

Dear Mr. Ghent:

On October 30, 1991 I received a request for a site-specific data search for the following area:

Woodbridge Research Facility - Dawson Beach Road
Woodbridge, Virginia

The parameters of this search was for a 1-mile radius around the site location, and the information needed was a complete data search including a mapping package except for the RCRA Facilities. ~~I was told to exclude the FINDS Database for this search.~~ Not true

This search covered the following databases:

NPL/Superfund Sites	Updated 10/10/91
NPL/Potentially Responsible Parties	Updated 11/01/91
CERCLA Sites	Updated 03/15/91
ERNS Hazardous Material Spills	Updated 05/05/91
State - Landfills	Updated 05/28/91
RCRA Notifier Facilities	Updated 05/05/91
RCRA Corrective Action Sites	Updated 04/10/91
RCRA Subtitle D Landfills	Updated 12/01/86
Leaking UST's / State Spills	Updated 09/30/91

Note # 1 - ERNS is the Environmental Protection Agency's EMERGENCY RESPONSE NOTIFICATION SYSTEM for reporting hazardous material spills.

Note # 2 - The RCRA Subtitle D Landfills was last updated by the EPA in December of 1986. They are planning an update of this data in 1991.

Note #3 - The Commonwealth of Virginia maintains a composite database of reported Leaking UST's and Hazardous Spills. This composite database was the one used in this data search. The search we performed encountered the following occurrences:

0 NPL/Superfund Sites
0 NPL/Superfund Potentially Responsible Parties
2 CERCLA Sites
5 Hazardous Material Spills
0 Reported State Landfills
21 RCRA Notifier Facilities
0 RCRA Corrective Action Sites
0 RCRA Subtitle D Landfills
21 Leaking Underground Storage Tanks/State Spills

The reports for the environmental occurrences are enclosed.

In the FINDS database search I only looked at the FINDS facilities that were not covered under any of the other EPA or State databases.

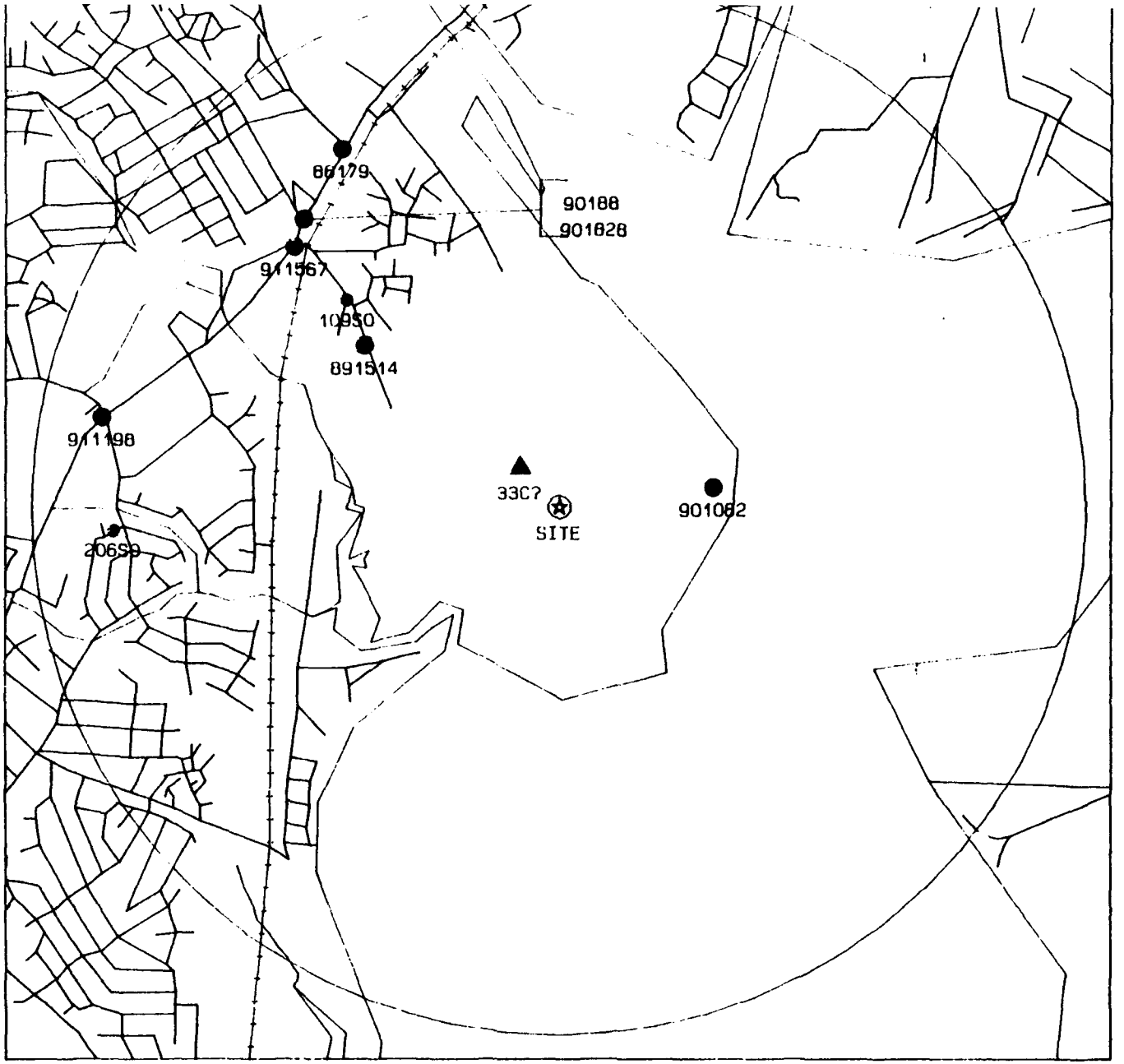
The Commonwealth of Virginia has instituted the Registered UST data system. I have ordered the information and it will be available by November 31, 1991.

Please note that I included the reports for (14) Leaking UST/State Spills, (3) ERNS Hazardous Spills, and (1) CERCLA Site that were not mapped because of insufficient address information. The reports without the map numbers are the ones we could not locate. These reports are for your reference.

If there are any questions please feel free to call me. Thank you for doing business with Environmental Database.

Sincerely,

Paul Lehnertz



U.S. Army-Woodbridge Research Facility
Scale: 1" = 2000' \ Environmental Map

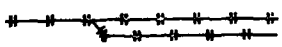
U.S. Army-Woodbridge Research Facility
Scale: 1" = 2000' \ Street Map

MAP KEY

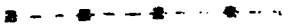
- ⛤ - SITE for Environmental Data-Search
- ■ - NPL/Superfund Site
- ▲ - CERCLA Site
- ⬢ - RCRA Generator or TSD Facility
- ⧓ - RCRA Corrective Action Site
- ● - Reported Hazardous Material Spill
- ♦ - SARA Title III - Toxic Release Inventory Facility
- ♦ - Landfill or RCRA Subtitle D Waste Landfill
- ● - Reported Leaking Underground Storage Tanks
- ○ - Registered Underground Storage Tanks
- □ - FINDS Location

LINEAR FEATURES

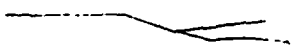
RAILROAD TRACK



POWER LINE



RIVER / WATER FEATURE



ROAD / STREET

PIPELINE

ADDITIONAL

- _____
- _____
- _____

CERCLA SITE REPORT

Map Number: **33C**

EPA ID Number: **VA7210020981** EPA region: **03**

Site Name: **USA WOODBRIDGE RESEARCH FACILITY**

Address: **DAWSON BEACH ROAD**

City: **WOODBRIDGE** Zip: **22191**

County: **PRINCE WILLIAM**

County Code: **153** Congressional District: **08**

USGS Hydrological Unit: **02070010**

Date Of Last EPA Update: **08/21/90**

Federal Facility Flag-: **FEDERAL FACILITY**
Ownership Indicator---: **FEDERAL**
Site Incident Category: **HAS NOT BEEN DETERMINED**

Site Description:

Further Action Necessary: **HAS NOT BEEN DETERMINED**

NPL/Superfund Status Of The Site:
THE SITE IS NOT AND NEVER HAS BEEN ON THE PROPOSED AND/OR FINAL NPL

Is The Site Associated With A RCRA Facility:

========== EPA Events That Have Taken Place At The Site ==========

EVENT	GROUP RESPONSIBLE	DATE
DISCOVERY OF A SITE	**EPA - FUND FINANCED**	**01/01/84**
PRELIMINARY ASSESSMENT	**FEDERAL FACILITY**	**02/01/85**

CERCLA SITE REPORT

Map Number:

EPA ID Number: **VAD981109986** EPA region: **03**

Site Name: **UNITED FIBER GLASS INC**

Address: **FEATHERSTONE INDUSTRIAL PARK**

City: **WOODBRIDGE** Zip: **22191**

County: **PRINCE WILLIAM**

County Code: **153** Congressional District: **08**

USGS Hydrological Unit: **02070010**

Date Of Last EPA Update: **02/06/91**

Federal Facility Flag-: **IS NOT A FEDERAL FACILITY**
Ownership Indicator---: **OTHER**
Site Incident Category: **HAS NOT BEEN DETERMINED**

Site Description:
CLOSED FIBERGLASS MANUFACTURING SITE

Further Action Necessary: **HAS NOT BEEN DETERMINED**

NPL/Superfund Status Of The Site:
THE SITE IS NOT AND NEVER HAS BEEN ON THE PROPOSED AND/OR FINAL NPL

Is The Site Associated With A RCRA Facility:

========== EPA Events That Have Taken Place At The Site ==========

EVENT	GROUP RESPONSIBLE	DATE
DISCOVERY OF A SITE	**EPA - FUND FINANCED**	**02/18/86**
PRELIMINARY ASSESSMENT	**STATE - FUND FINANCED**	**12/31/86**
SCREENING SITE INSPECTION	**STATE - FUND FINANCED**	

VIRGINIA WATER CONTROL BOARD
POLLUTION REMEDIATION PROGRAM

MAP #: **86179** Fiscal Year: 86
Date: 8/30/85

Complaint Number: 179
City/County: Prince William Co.

Incident Description:

LUST at Ray's Amoco 13404 Jeff-Davis Hwy.

Pollutant: PETROLEUM
Amount Spilled - Gallons-: 2000
Amount To Water - Gallons: 1400

Waterbody Possibly Effected: GROUNDWATER

Cleaned Up By: Handex
Clean Up Code: CONTRACTOR

Responsible Party: Amoco
Spiller/Discharger: Amoco
Report Status: COMPLETE REPORT ON FILE
Cost-Recovery Letter: NO

==========

MAP #: **891514** Fiscal Year: 89
Date: 5/11/89

Complaint Number: 1514
City/County: Prince William Co.

Incident Description:
---
umpermitted discharge of wash water at 13800 Dawson Beach Rd., Dawson Beach Industrial Park

Pollutant: MISCELLANEOUS
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected: Marumscoe Cr.

Cleaned Up By:
Clean Up Code:

Responsible Party: Arban Carosi
Spiller/Discharger: Arban Carosi
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

VIRGINIA WATER CONTROL BOARD
POLLUTION REMEDIATION PROGRAM

MAP #: **90188** Fiscal Year: 90
Date: 8/11/89

Complaint Number: 188
City/County: Prince William Co.

Incident Description:

LUST of gas at 13601 Jeff Davis Hwy., Woodbridge; tank failed tightness test; product in monitoring wells;tanks pumped

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected:

Cleaned Up By:
Clean Up Code:

Responsible Party: Exxon
Spiller/Discharger: Exxon
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

MAP #: **901082** Fiscal Year: 90
Date: 2/22/90

Complaint Number: 1082
City/County: Prince William Co.

Incident Description:
---
motor oil from UST system at Woodbridge Research Facility, end of Dawson Beach Rd.

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected:

Cleaned Up By:
Clean Up Code:

Responsible Party: Woodbridge Research Facility
Spiller/Discharger: Woodbridge Research Facility
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

VIRGINIA WATER CONTROL BOARD
POLLUTION REMEDIATION PROGRAM

MAP #: **901828** Fiscal Year: 90
Date: 6/22/90

Complaint Number: 1828
City/County: Prince William Co.

Incident Description:

UST of waste oil failed tightness test at Exxon, 13601 Jeff Davis Blvd., Woodbridge

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected:

Cleaned Up By:
Clean Up Code:

Responsible Party: Exxon
Spiller/Discharger: Exxon
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

MAP #: **911198** Fiscal Year: 91
Date: 2/19/91

Complaint Number: 1198
City/County: Prince William Co.

Incident Description:
---
line leak of gas at 14014 Jeff Davis Hwy., Woodbridge; sat soils removed

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected:

Cleaned Up By:
Clean Up Code:

Responsible Party: Superamerica Petroleum Co.
Spiller/Discharger: Superamerica Petroleum Co.
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

VIRGINIA WATER CONTROL BOARD
POLLUTION REMEDIATION PROGRAM

MAP #: **911567** Fiscal Year: 91
Date: 4/24/91

Complaint Number: 1567
City/County: Prince William Co.

Incident Description:
---
soil contamination of heating oil from UST system at RF&P, 13609 Jeff Davis Hwy., Woodbridge

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected:

Cleaned Up By:
Clean Up Code:

Responsible Party: RF&P
Spiller/Discharger: RF&P
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

MAP #: Fiscal Year: 86
Date: 11/19/85

Complaint Number: 379
City/County: Prince William Co.

Incident Description:
---
gasoline migrating to storm sewer from a filter leak at the station

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected: Marumsco Cr.

Cleaned Up By:
Clean Up Code:

Responsible Party: Shell Oil Co.
Spiller/Discharger:
Report Status: COMPLETE REPORT ON FILE
Cost-Recovery Letter:

==========

VIRGINIA WATER CONTROL BOARD
POLLUTION REMEDIATION PROGRAM

MAP #: Fiscal Year: 86
Date: 1/09/86

Complaint Number: 459
City/County: Prince William Co.

Incident Description:
---
gasoline spilled from a LUST at the station to x-trib(Cont. Fund used), and has contaminated GW, site assessment planned

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected: GROUNDWATER

Cleaned Up By: Emergency Special Ser./VWCB
Clean Up Code: STATE FUNDED CLEAN UP

Responsible Party: Sung's Citgo
Spiller/Discharger: Sung's Citgo
Report Status: COMPLETE REPORT ON FILE
Cost-Recovery Letter:

==========

MAP #: Fiscal Year: 86
Date: 4/29/86

Complaint Number: 701
City/County: Prince William Co.

Incident Description:
---
report of oil and anti-freeze dumping, investigation found a waste oil drains to a sump

Pollutant: NO EVIDENCE OF POLLUTION
Amount Spilled - Gallons-: 0
Amount To Water - Gallons: 0

Waterbody Possibly Effected:

Cleaned Up By:
Clean Up Code:

Responsible Party: Jiffy Lube
Spiller/Discharger: Jiffy Lube
Report Status: COMPLETE REPORT ON FILE
Cost-Recovery Letter:

==========

VIRGINIA WATER CONTROL BOARD
POLLUTION REMEDIATION PROGRAM

MAP #: Fiscal Year: 86
Date: 6/04/86

Complaint Number: 792
City/County: Prince William Co.

Incident Description:
---
leak in line contaminated soil

Pollutant: PETROLEUM
Amount Spilled - Gallons-: 60
Amount To Water - Gallons: 0

Waterbody Possibly Effected:

Cleaned Up By: Petro Supply/Handex
Clean Up Code: CONTRACTOR

Responsible Party: Occoquan Shell
Spiller/Discharger: Occoquan Shell
Report Status: COMPLETE REPORT ON FILE
Cost-Recovery Letter:

==========

MAP #: Fiscal Year: 87
Date: 7/17/86

Complaint Number: 38
City/County: Prince William Co.

Incident Description:

LUST at station, oil seeped out of banks to the river

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected: Occoquan R.

Cleaned Up By:
Clean Up Code:

Responsible Party: Stringers Exxon
Spiller/Discharger:
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

VIRGINIA WATER CONTROL BOARD
POLLUTION REMEDIATION PROGRAM

MAP #: Fiscal Year: 87
Date: 7/16/86

Complaint Number: 39
City/County: Prince William Co.

Incident Description:

LUST at Mobil station

Pollutant: PETROLEUM
Amount Spilled - Gallons-: 3600
Amount To Water - Gallons: 1000

Waterbody Possibly Effected: GROUNDWATER

Cleaned Up By: Clean America
Clean Up Code: CONTRACTOR

Responsible Party: Mobil Oil Co.
Spiller/Discharger: Mobil Oil Co.
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

MAP #: Fiscal Year: 87
Date: 7/28/86

Complaint Number: 81
City/County: Prince William Co.

Incident Description:
---
oil in Shirley's well source unknown, suspect LUST at neighboring Reddington home

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected: GROUNDWATER

Cleaned Up By: none
Clean Up Code: NONE

Responsible Party: F.J. Reddington
Spiller/Discharger:
Report Status: COMPLETE REPORT ON FILE
Cost-Recovery Letter: NO

==========

VIRGINIA WATER CONTROL BOARD
POLLUTION REMEDIATION PROGRAM

MAP #: Fiscal Year: 87
Date: 1/14/87

Complaint Number: 484
City/County: Prince William Co.

Incident Description:

TCE and PCE found in the gruond water, believed to be from past dumping, case referred to DWM

Pollutant: CHEMICAL/HAZARDOUS MATERIALS
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected: GROUNDWATER

Cleaned Up By:
Clean Up Code:

Responsible Party: Atlantic Research Corp.
Spiller/Discharger: Atlantic Research Corp.
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

MAP #: Fiscal Year: 87
Date: 2/20/87

Complaint Number: 615
City/County: Prince William Co.

Incident Description:
---
diesel leaked from sunken P/C owmed by Mr. Rippy

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected: Occoquan R.

Cleaned Up By: none
Clean Up Code: NONE

Responsible Party: John Rippy
Spiller/Discharger: John Rippy
Report Status: COMPLETE REPORT ON FILE
Cost-Recovery Letter: NO

==========

VIRGINIA WATER CONTROL BOARD
POLLUTION REMEDIATION PROGRAM

MAP #: Fiscal Year: 89
Date: 10/06/88

Complaint Number: 387
City/County: Prince William Co.

Incident Description:
---
uncl- sewage discharged from marina, no holding tank or pump facilities

Pollutant: SEWAGE
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected: Neabsco Cr.

Cleaned Up By:
Clean Up Code:

Responsible Party: East Cruise Marina
Spiller/Discharger: East Cruise Marina
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

MAP #: Fiscal Year: 89
Date: 10/25/88

Complaint Number: 446
City/County: Prince William Co.

Incident Description:
---
suspect Build America Complex of pumping waste oil & grease to storm drain

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected:

Cleaned Up By:
Clean Up Code:

Responsible Party: Build America Complex
Spiller/Discharger: Build America Complex
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

VIRGINIA WATER CONTROL BOARD
POLLUTION REMEDIATION PROGRAM

MAP #: Fiscal Year: 89
Date: 1/09/89

Complaint Number: 760
City/County: Prince William Co.

Incident Description:

LUST of gas/petroleum at Bethlehem Rebar Industry site; tank removed; site assessment shows contamination limited to soils

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected:

Cleaned Up By: ICF Technology
Clean Up Code: CONTRACTOR

Responsible Party: The Wrench Group
Spiller/Discharger: The Wrench Group
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

MAP #: Fiscal Year: 90
Date: 12/28/89

Complaint Number: 785
City/County: Prince William Co.

Incident Description:
---
petroleum in x-trib behind Woodbridge Forest Apartments, Rt. 123; source unknown

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected: x-trib

Cleaned Up By:
Clean Up Code:

Responsible Party:
Spiller/Discharger:
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

VIRGINIA WATER CONTROL BOARD
POLLUTION REMEDIATION PROGRAM

MAP #: Fiscal Year: 90
Date: 5/04/90

Complaint Number: 1526
City/County: Prince William Co.

Incident Description:
---
soil contamination of gas from an UST system, Shell, 12851 Gordon Blvd.; tank removed

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected:

Cleaned Up By: Stone & Hoover
Clean Up Code: CONTRACTOR

Responsible Party: Shell
Spiller/Discharger: Shell
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

MAP #: Fiscal Year: 87
Date: 12/22/86

Complaint Number: 416
City/County: Fairfax Co.

Incident Description:
---
oil found in observation wells on the property, suspect LUSTs, tank tests were negative

Pollutant: NO EVIDENCE OF POLLUTION
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected: GROUNDWATER

Cleaned Up By:
Clean Up Code:

Responsible Party: A.P. Woodson Co.
Spiller/Discharger:
Report Status: COMPLETE REPORT ON FILE
Cost-Recovery Letter:

==========

VIRGINIA WATER CONTROL BOARD
POLLUTION REMEDIATION PROGRAM

MAP #: Fiscal Year: 87
Date: 12/29/86

Complaint Number: 429
City/County: Fairfax Co.

Incident Description:
---
gasoline in excavation at an old gas station from a LUST, soil removed and monitoring wells installed

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected: GROUNDWATER

Cleaned Up By: none
Clean Up Code: NONE

Responsible Party: Key Auto Upholstery
Spiller/Discharger: Key Auto Upholstery
Report Status: COMPLETE REPORT ON FILE
Cost-Recovery Letter: NO

==========

MAP #: Fiscal Year: 89
Date: 11/03/88

Complaint Number: 487
City/County: Fairfax Co.

Incident Description:

LUST from previous Exxon station, station changing to Jiffy Lube

Pollutant: PETROLEUM
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected: GROUNDWATER

Cleaned Up By: JHS Construction
Clean Up Code: CONTRACTOR

Responsible Party: Exxon USA
Spiller/Discharger: Exxon USA
Report Status: COMPLETE REPORT NOT ON FILE
Cost-Recovery Letter:

==========

VIRGINIA WATER CONTROL BOARD
POLLUTION REMEDIATION PROGRAM

MAP #:

Fiscal Year: 86
Date: 4/30/86

Complaint Number: 706
City/County: Fairfax Co.

Incident Description:
---
sheen on the river 3/4 of a mile long, no source found

Pollutant: NO EVIDENCE OF POLLUTION
Amount Spilled - Gallons-:
Amount To Water - Gallons:

Waterbody Possibly Effected: Occoquan River

Cleaned Up By: none
Clean Up Code: NONE

Responsible Party: unknown
Spiller/Discharger: unknown
Report Status: COMPLETE REPORT ON FILE
Cost-Recovery Letter:

HAZARDOUS MATERIAL SPILL REPORT

Map Number: 10988

Report Number: 04323

Date Spill Was Reported: 04/05 1988
Date Of Spill: 04/05 1988

Spill Location:
DABNEY ROAD

City: WOODBRIDGE

County: PRINCE WILLIAM Zip Code:

Material And Amount Spilled

LIME SLURRY UNKNOWN Amount

Environments Possibly Effected By The Spill:
LAND

Agencies Notified Of Spill:

Action Taken:

Description: DUMPING INTO PIT FOR STORAGE UNTIL BEING PICKED

Comments:

Potentially Responsible Party Information=====

PRP: UNKNOWN
DABNEY RD
WOODBRIDGE
VA 22191

Telephone:

HAZARDOUS MATERIAL SPILL REPORT

Map Number: 20680

Report Number: VA90146

Date Spill Was Reported: 03/07 1990
Date Of Spill: 03/06 1990

Spill Location:
14202 RANDALL DRIVE

City: WOODBRIDGE

County: PRINCE WILLIAM Zip Code: 22152

Material And Amount Spilled

UNKNOWN OIL UNKNOWN Amount

Environments Possibly Effected By The Spill:
UNKNOWN

Agencies Notified Of Spill:

Action Taken:

Description: PRIVATE RESIDENCE

Comments: * PROPERTY. REPORTER STATES HIS PROPERTY IS SATURATED WITH OIL.

Potentially Responsible Party Information=====

PRP: UNKNOWN OCCUPANT
14202 RANDALL DRIVE
WOODBRIDGE
VA 22152

Telephone:

HAZARDOUS MATERIAL SPILL REPORT

Map Number:

Report Number: 01999

Date Spill Was Reported: 02/20 1987
Date Of Spill: 02/20 1987

Spill Location:
ON OCCOQUAN, COMING FROM UP STREAM, SIGHTED WHILE OVER RT1 BRIDGE

City: WOODBRIDGE

County: PRINCE WILLIAM Zip Code:

Material And Amount Spilled

UNKNOWN OIL UNKNOWN Amount

Environments Possibly Effected By The Spill:
OCCOQUAN RIVER

Agencies Notified Of Spill:

Action Taken:

Description: UNKNOWN, POSSIBLY COMING FROM MARINA

Comments:

Potentially Responsible Party Information=====

PRP: UNKNOWN

Telephone:

HAZARDOUS MATERIAL SPILL REPORT

Map Number:

Report Number: VA89008

Date Spill Was Reported: 10/06 1988
Date Of Spill:

Spill Location:
EASY CRUISE MARINA

City: WOODBRIDGE

County: PRINCE WILLIAM Zip Code:

Material And Amount Spilled

SEWAGE UNKNOWN Amount

Environments Possibly Effected By The Spill:
NEABSCO

Agencies Notified Of Spill:

Action Taken:

Description:

Comments:

Potentially Responsible Party Information=====

PRP: EASY CRUISE MARINA

WOOD BRIDGE
VA 22191

Telephone:

HAZARDOUS MATERIAL SPILL REPORT

Map Number:

Report Number: 22657

Date Spill Was Reported: 12/19 1989
Date Of Spill: 12/19 1989

Spill Location:
WOODBRIDGE MOBIL STATION - NO ADDRESS REPORTED

City: WOODBRIDGE

County: PRINCE WILLIAM Zip Code:

Material And Amount Spilled

GASOLINE 00004500.00 Gallons

Environments Possibly Effected By The Spill:
UNNAMED STREAM>OCCOQUAN RIVER

Agencies Notified Of Spill: WATER CONTROL BOARD

Action Taken:

Description:

Comments:

Potentially Responsible Party Information=====

PRP: WOODBRIDGE MOBIL STATION

Telephone:

RCRA FACILITY REPORT

Map Number:

EPA ID Number: VAD988172581 Date Of Last EPA Update: 90/08/14

Facility Name: BEDSOLE GENE STEPHEN
Address: 13313 OCCAQUAN RD
City: WOODBIRDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: SMALL QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: STAR ENTERPRISE

Facility Contact: LATTIMER KENNETH_D MGR
Address: 4 EXECUTIVE PARK EAST NE
City: ATLANTA
State: GA Zip Code: 30329 Telephone: 404 329-5408

==========

Map Number:

EPA ID Number: VAD044977395 Date Of Last EPA Update: 90/11/27

Facility Name: TOWN & COUNTRY BUICK
Address: 1108 HORNER RD
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: LARGE QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: HOFHEIMER, BENJAMIN

Facility Contact: GINTHER, CRAIG
Address: 1108 HORNER RD
City: WOODBRIDGE
State: VA Zip Code: 22191 Telephone: 703 494-5116

==========

Map Number:

EPA ID Number: VAD988172557 Date Of Last EPA Update: 90/08/14

Facility Name: WARNER JOHN M
Address: 13254 JEFF DAVIS HWY
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: SMALL QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: STAR ENTERPRISE

Facility Contact: LATTIMER KENNETH_D MGR
Address: 4 EXECUTIVE PARK EAST NE
City: ATLANTA
State: GA Zip Code: 30329 Telephone: 404 329-5408

==========

Map Number:

EPA ID Number: VAD981107931 Date Of Last EPA Update: 90/11/27

Facility Name: KWALITY CLEANERS
Address: 13309 OCCOQUAN RD
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: LARGE QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: MEHRA, MOHAN OWNER

Facility Contact: MEHRA, MOHAN
Address: 13309 OCCOQUAN RD
City: WOODBRIDGE
State: VA Zip Code: 22191 Telephone: 703 491-1313

==========

RCRA FACILITY REPORT

Map Number:

EPA ID Number: VAD988174991 Date Of Last EPA Update: 90/09/11

Facility Name: DIRK-WILSON INC T/A JIFFY LUBE
Address: 13319 OCCOQUAN RD
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: SMALL QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: HANBACK DONALD

Facility Contact: BUTORAC ROBERT MGk
Address: 13319 OCCOQAUN RD
City: WOODBRIDGE
State: VA Zip Code: 22191 Telephone: 202 965-9550

==========

Map Number:

EPA ID Number: VAD000762294 Date Of Last EPA Update: 90/11/27

Facility Name: SUNOCO SERVICE STATION
Address: 13400 JEFFERSON DAVIS HWY
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type:
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable): NON-REGULATED UNDER RCRA

Facility Type: PRIVATE

Owner Name------: SUN OIL COMPANY OF PENNSYLVANIA

Facility Contact: GRAY, DON MAINT MGR
Address: 13400 JEFFERSON DAVIS HWY
City: WOODBRIDGE
State: VA Zip Code: 22191 Telephone: 301 341-0100

==========

Map Number:

EPA ID Number: VAD981102544 Date Of Last EPA Update: 90/11/27

Facility Name: WOODBRIDGE CLEANERS
Address: 13417 JEFFERSON DAVIS HWY
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: LARGE QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: WELBORN J C

Facility Contact: WELBORN, JOSEPH C MANAGER
Address: 13417 JEFFERSON DAVIS HWY
City: WOODBRIDGE
State: VA Zip Code: 22191 Telephone: 703 494-9474

==========

Map Number:

EPA ID Number: VAD131481012 Date Of Last EPA Update: 90/11/27

Facility Name: BRIDGE TAILORS & DRY CLEANERS
Address: 13438 JEFF-DAVIS HWY
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: SMALL QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: GARDNER, ANN & THOMAS

Facility Contact: GARDNER, THOMAS CO-OWNER
Address: 13438 JEFF-DAVIS HWY
City: WOODBRIDGE
State: VA Zip Code: 22191 Telephone: 703 494-8677

==========

RCRA FACILITY REPORT

Map Number:

EPA ID Number: VAD982661688 Date Of Last EPA Update: 90/11/27

Facility Name: CHEVRON USA
Address: 13452 JEFFERSON DAVIS HWY
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: SMALL QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: CHEVRON USA

Facility Contact: VUKELICH, NANCY CONST MAINT RP
Address: PO BOX 2235
City: BALTIMORE
State: MD Zip Code: 21203 Telephone: 301 821-4034

==========

Map Number:

EPA ID Number: VAD024010795 Date Of Last EPA Update: 90/11/27

Facility Name: COWLES FORD INC
Address: 13494 JEFFERSON DAVIS HWY
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: VERY SMALL QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: COWLES FORD INC

Facility Contact: LAWSON LESTER SHOP FORMAN
Address: 13494 JEFFERSON DAVIS HWY
City: WOODBRIDGE
State: VA Zip Code: 22191 Telephone: 703 690-3040

==========

RCRA FACILITY REPORT

Map Number:

EPA ID Number: VAD981936602 Date Of Last EPA Update: 90/11/27

Facility Name: DOMINION X-RAY & MEDICAL SUPPL
Address: 13536 JEFFERSON DAVIS HWY
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: SMALL QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: BOYER, JANICE

Facility Contact: BOYER, JANICE PRESIDENT
Address: 13536 JEFFERSON DAVIS HWY
City: WOODBRIDGE
State: VA Zip Code: 22191 Telephone: 703 494-9511

==========

Map Number:

EPA ID Number: VAD982568362 Date Of Last EPA Update: 90/11/27

Facility Name: T J CLEANERS
Address: 13670 JEFFERSON DAVIS HWY
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: SMALL QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: GEUN, DONG OH

Facility Contact: YOUNG, MI CHO
Address: 13670 JEFFSON DAVIS HWY
City: WOODBRIDGE
State: VA Zip Code: 22191 Telephone: 703 494-6888

==========

RCRA FACILITY REPORT

Map Number:

EPA ID Number: VAD981936636 Date Of Last EPA Update: 90/11/27

Facility Name: GOODYEAR AUTO SERVICE CENTER
Address: 13701 JEFFERSON DAVIS
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: SMALL QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: GOODYEAR T & R CO

Facility Contact: WHITE, G A A DIST MGR
Address: 4625 HOLLINS FERRY RD
City: BALTIMORE
State: MD Zip Code: 21227 Telephone: 301 247-0900

==========

Map Number:

EPA ID Number: VAD000762278 Date Of Last EPA Update: 90/11/27

Facility Name: SERVICE STATION SUNOCO
Address: 13731 JEFFERSON DAVIS HWY
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type:
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable): NON-REGULATED UNDER RCRA

Facility Type: PRIVATE

Owner Name------: SUN OIL COMPANY OF PENNSYLVANIA

Facility Contact: GRAY, DON MAINT MGR
Address: 13731 JEFFERSON DAVIS HWY
City: WOODBRIDGE
State: VA Zip Code: 22191 Telephone: 301 341-0100

==========

Map Number:

EPA ID Number: VAD981041338 Date Of Last EPA Update: 90/11/27

Facility Name: J D CLEANERS T/A CREST
Address: 13919 JEFFERSON DAVIS HWY
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: LARGE QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: SLAN ALLEN

Facility Contact: WILHOIT, JEFF
Address: 7959 TWIST LN
City: SPRINGFIELD
State: VA Zip Code: 22153 Telephone: 703 550-7878

==========

Map Number:

EPA ID Number: VAD087697405 Date Of Last EPA Update: 90/11/27

Facility Name: BELVOIR AMC JEEP RENAULT
Address: 14120 JEFFERSON DAVIS HWY
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: SMALL QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: BELVOIR AMC JEEP INC

Facility Contact: CHAMBERLAIN, JACK SD
Address: 14120 JEFFERSON DAVIS HWY
City: WOODBRIDGE
State: VA Zip Code: 22191 Telephone: 703 494-3919

==========

RCRA FACILITY REPORT

Map Number:

EPA ID Number: VAD981040629 Date Of Last EPA Update: 90/11/27

Facility Name: O K BODY SHOP
Address: 14218 JEFFERSON DAVIS HWY
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: SMALL QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------:

Facility Contact: YEOM, SANG D OWNER
Address: 14218 JEFFERSON DAVIS HWY
City: WOODBRIDGE
State: VA Zip Code: 22191 Telephone: 703 494-1515

==========

Map Number:

EPA ID Number: VA0210000907 Date Of Last EPA Update: 90/11/27

Facility Name: U S WOODBRIDGE RESEARCH FACILI
Address: DAWSON BEACH RD
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type: SMALL QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: FEDERAL FACILITY

Owner Name------: US ARMY

Facility Contact: BOWER THOMAS DEP CH ST RISK MG
Address: SLCIS RK 2800 POWDER MILL RD
City: ADELPHI
State: MD Zip Code: 20783 Telephone: 202 394-3446

==========

RCRA FACILITY REPORT

Map Number:

EPA ID Number: VAD000823674 Date Of Last EPA Update: 90/11/27

Facility Name: SHERWIN-WILLIAMS CO THE
Address: MARUMSCO PLZ SHPG CTR 13805MT
City: WOODBRIDGE Zip Code: 22191
County: PRINCE WILLIAM

RCRA Generator Type:
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable): NON-REGULATED UNDER RCRA

Facility Type: PRIVATE

Owner Name------: SHERWIN-WILLIAMS CO

Facility Contact: WILLIAMS, H B JR
Address: MARUMSCO PLZ SHPG CTR 13805MT
City: WOODBRIDGE
State: VA Zip Code: 22191 Telephone: 216 566-3096

==========

Map Number:

EPA ID Number: VAD053935839 Date Of Last EPA Update: 90/11/27

Facility Name: BETHLEHEM STEEL CORP
Address: 1255 FEATHERSTONE RD
City: WOODBRIDGE Zip Code: 22194
County: PRINCE WILLIAM

RCRA Generator Type:
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable): NON-REGULATED UNDER RCRA

Facility Type: PRIVATE

Owner Name------:

Facility Contact:
Address: 1255 FEATHERSTONE RD
City: WOODBRIDGE
State: VA Zip Code: 22194 Telephone:

==========

RCRA FACILITY REPORT

Map Number:

EPA ID Number: VAD023978620 Date Of Last EPA Update: 90/11/27

Facility Name: LUSTINE TOYOTA
Address: 14227 JEFFERSON DAVIS HWY
City: WOODBRIDGE Zip Code: 22194
County: PRINCE WILLIAM

RCRA Generator Type: LARGE QUANTITY
RCRA TSD Type------:
RCRA Transporter---:
RCRA Non-Regulated Type (If Applicable):

Facility Type: PRIVATE

Owner Name------: GUNNING, JOHN

Facility Contact: GUNNING, JOHN GM
Address: 14227 JEFFERSON DAVIS HWY
City: WOODBRIDGE
State: VA Zip Code: 22194 Telephone: 703 494-9154

APPENDIX B

EXCERPT OF ARCHEOLOGICAL REPORT

From

Final
Report No. 15
July 1985

An Archeological Overview and Management Plan for the Harry Diamond Laboratories-Woodbridge Research Facility

Under Contract CX4000-3-0018
with the

National Park Service
U.S. Department of the Interior
Philadelphia, Pennsylvania 19106

for the
U.S. Army Material Development and
Readiness Command

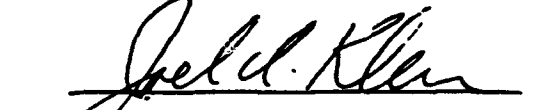
by

Thunderbird Archeological Associates, Inc.
Front Royal, Virginia 22630

and

Envirosphere Company
2 World Trade Center
New York, New York 10048

Prepared under the Supervision of



Joel I. Klein, Principal Investigator
Envirosphere Company

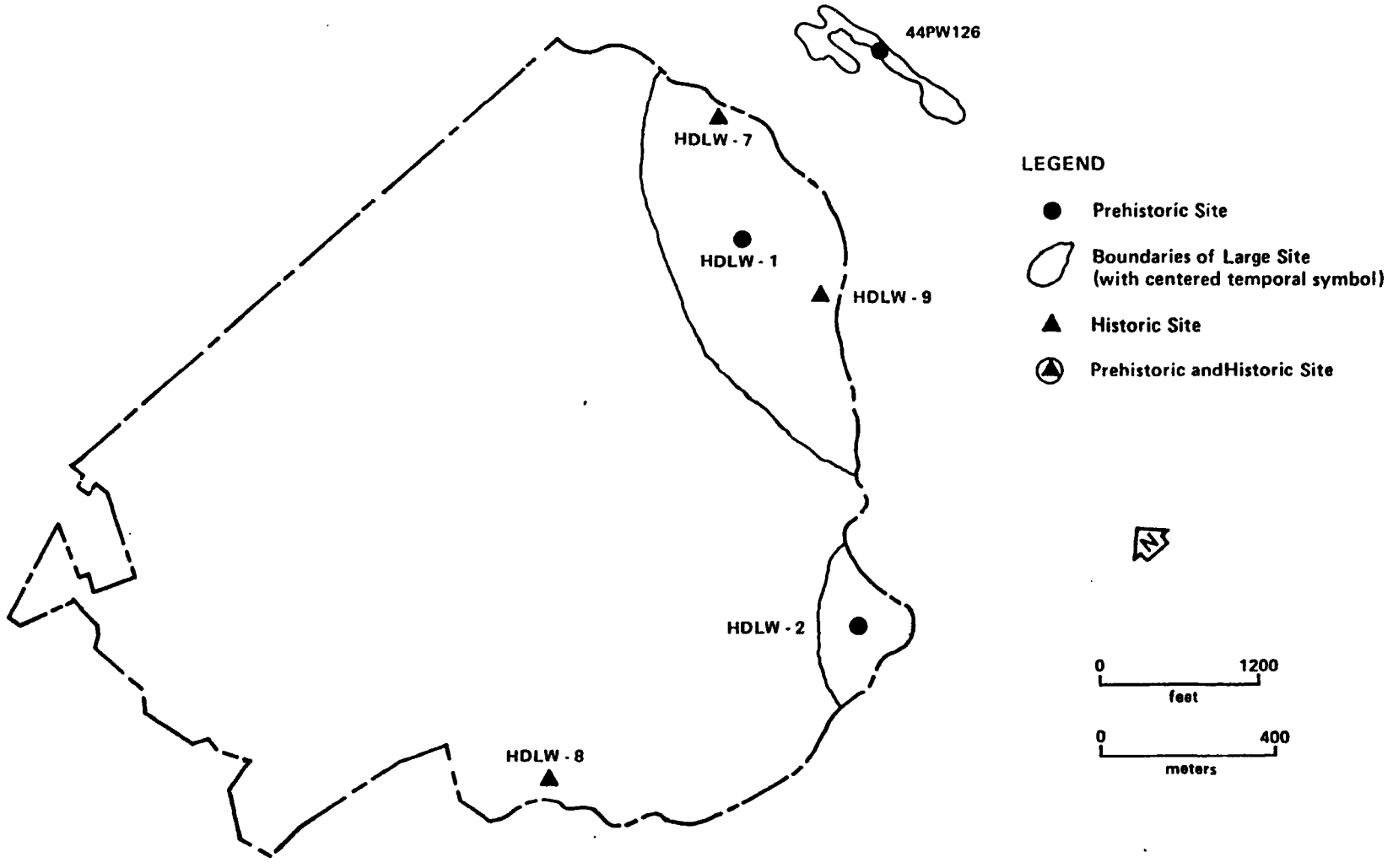


Figure A-1. A MAP OF KNOWN ARCHEOLOGICAL RESOURCES ON THE HARRY DIAMOND LABORATORIES- WOODBRIDGE RESEARCH FACILITY

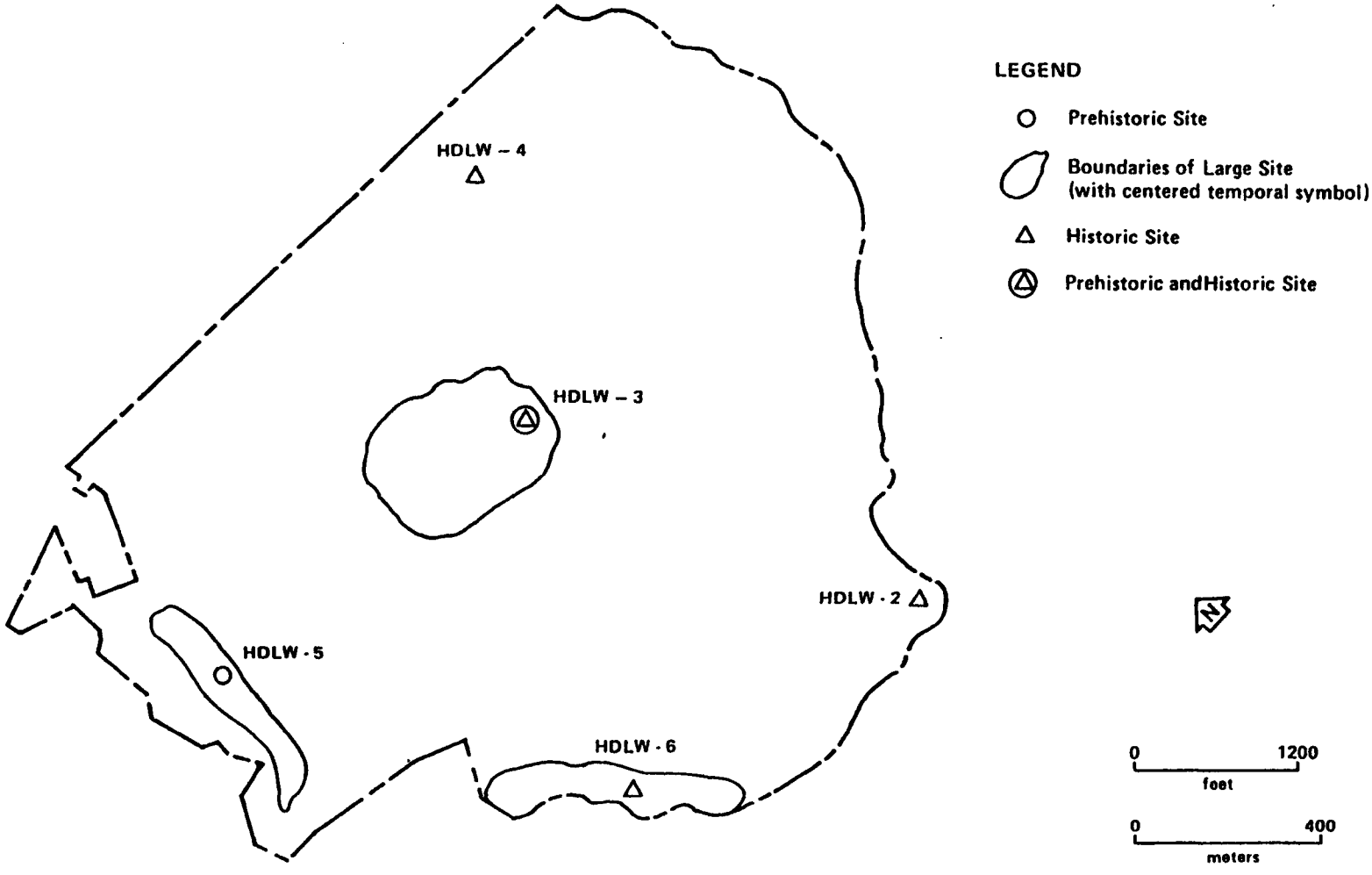


Figure A-2. A MAP OF POTENTIAL ARCHEOLOGICAL RESOURCES ON THE HARRY DIAMOND LABORATORIES - WOODBRIDGE RESEARCH FACILITY

APPENDIX C

FACILITY PERMIT

WRF EPA ID # for "Base Closure" Team.

EPA

ACKNOWLEDGEMENT OF NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

This is to acknowledge that you have filed a Notification of Hazardous Waste Activity for the installation located at the address shown in the box below to comply with Section 3010 of the Resource Conservation and Recovery Act *(RCRA)*. Your EPA Identification Number for that installation appears in the box below. The EPA Identification Number must be included on all shipping manifests for transporting hazardous wastes; on all Annual Reports that generators of hazardous waste, and owners and operators of hazardous waste treatment, storage and disposal facilities must file with EPA; on all applications for a Federal Hazardous Waste Permit; and other hazardous waste management reports and documents required under Subtitle C of RCRA.

EPA I.D. NUMBER → VA0210000907

INSTALLATION ADDRESS →

THOMAS BOWER, DCS RISK MGT
US ARMY LABORATORY CMD ATTN: SLCIS-RK
2800 POWDER MILL RD
ADELPHI, MD 20783

WOODBRIDGE RESEARCH FACILITY
DAWSON BEACH RD
WOODBRIDGE, VA 22191

EPA Form 8700-12A (4-80)

APPENDIX D

DOCUMENTATION OF TRANSFORMER

SLCIS-FE-ES (420) 6 September 1990

MEMORANDUM THRU Director, U.S. Army Adelphi Laboratory Center, Installation Support Activity, ATTN: SLCIS-D, 2800 Powder Mill Road, Adelphi, MD 20783-1145

FOR Installation Support Activity Director for Risk Management, ATTN: SLCIS-RK (B. Ghori), 2800 Powder Mill Road, Adelphi, MD 20783-1145

SUBJECT: PCB Testing of Transformers for Adelphi, MD, Blossom Point, MD, and Woodbridge, VA

1. Attached for your information is a copy of the PCB Testing of Transformers for Adelphi, MD, Blossom, MD, and Woodbridge VA. This report has also been provided to the Baltimore District Engineer.

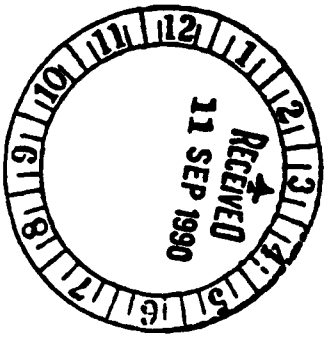
3. The Directorate of Facilities Engineering point of contact for this action is Wil Booth, SLCIS-FE-ES. He can be reached at DSN (AUTOVON) 290-2220 or (202) 394-2220.

RAY ROUDEBUSH
Director, Facilities Engineering

Encl

CF:
SLCIS-CC (A. Bailey)

Analysis of Transformer Oil for Base Closure Team.



M&J Electric, Inc.

9420 Annapolis Rd., Suite 210 • Lanham, Maryland 20706 • (301) 577-9030 FAX (301) 306-9746

August 26, 1990

Mr. William Booth
Harry Diamond Laboratories
Powder Mill Road
Silver Springs MD 20716

Subject: PCB Testing of Transformers
Adelphi, Md, Blossom Point, MD, and Woodbridge, VA

Job Number: A-108-U-01

During July and August 1990, EIS sampled and analyzed the dielectric fluid of 75 transformers at the three locations mentioned above. The results of this effort are as follows:

Facility	Total Tested	<50 ppm PCB (Clean)	>50 ppm PCB (Contaminated)
Adelphi, MD	41	5	36
Blossom Point, MD	25	18	7
Woodbridge, VA	8	7	1
TOTALS	74	30	44

(NOTE Sample # HDL-31 was issued in error and does not refer to any test)

The attachments to this letter include a listing of the transformers tested. The report for Woodbridge, and Adelphi are sorted by building location of the vault. The information for Blossom Point is organized by test numbers. Location diagrams and laboratory test results are also included.

The Transformer oil samples were analyzed by PPM Laboratories. The protocol used was electron capture gas chromatography as outlined in EPA-600/8-80-038, and NIOSH 5503.

Sincerely

M&J ELECTRIC, INC.

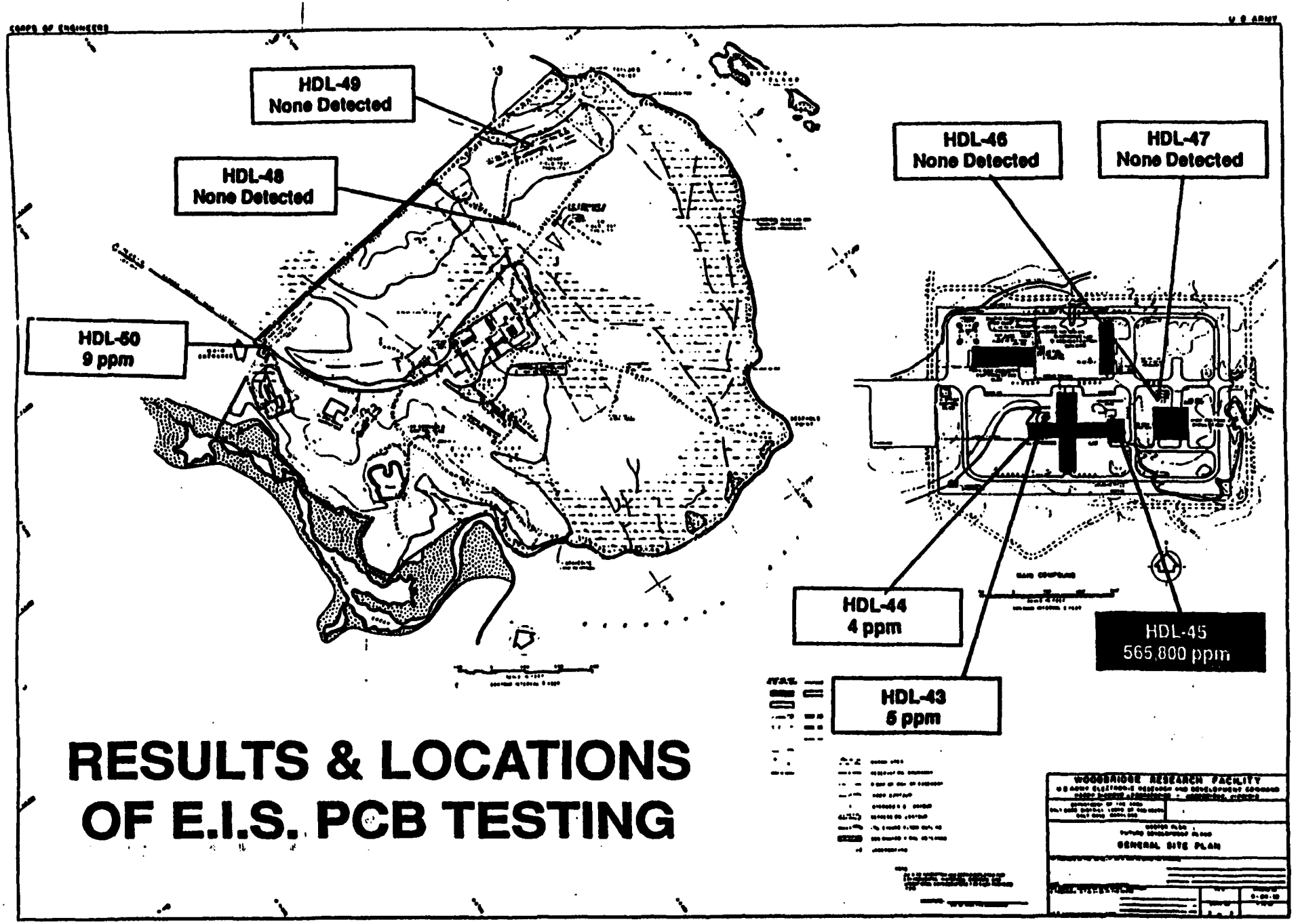
Robert M. Walter
President

SUMMARY DATA

WOODBRIDGE VA

Results of PCB Testing at Woodbridge

Sample ID	Room	Serial No.	Gallons	Oil Type	PCBs in PPM	PCB Type	
** BUILDING : 101							
HDL-50 WB	Pole				9	Aroclor 1254	
** BUILDING : 201							
HDL-44 WB	Outside	43738	376	Mineral Oil	4	Aroclor 1254	
HDL-43 WB	Outside	43737	376	Mineral Oil	5	Aroclor 1254	
HDL-45 WB	Outside	F693736	210	Pyranol	565,800	Aroclor 1260	<***
** BUILDING : 211							
HDL-46 WB	Outside	M586235TJPA	96	Mineral Oil		None detected	
HDL-47 WB	Outside	M322304TJPA	130	Mineral Oil		None detected	
** BUILDING : 306							
HDL-49 WB	Outside	M322167TJPA	93	Mineral Oil		None detected	
** BUILDING : Field							
HDL-48 WB	Outside	81ZD54A001	96	Mineral Oil		None detected	


HDL-49
None Detected
HDL-48
None Detected
HDL-50
9 ppm
HDL-46
None Detected
HDL-47
None Detected
HDL-44
4 ppm
HDL-45
565,800 ppm
HDL-43
5 ppm
RESULTS & LOCATIONS
OF E.I.S. PCB TESTING

CERTIFIED

LABORATORY RESULTS

PPM INC.

A USPCI, Inc. Company

1875 FORGE STREET
TUCKER, GA 30084
(404) 934-0902

August 17, 1990

EIS, Inc.
9420 Annapolis Road
Lanham, MD 20706

File #8525-0817

ATTENTION: Frank Krawzel

CERTIFIED PCB OIL ANALYSIS

Customer Identification	PCB Level
1. 43W HDL	5 ppm, Aroclor 1254
2. 44W HDL	4 ppm, Aroclor 1254
3. 45W HDL	565,800 ppm, Aroclor 1260
4. 51B HDL	2 ppm, Aroclor 1242 65 ppm, Aroclor 1260 67 ppm total
5. 52B HDL	2 ppm, Aroclor 1254
6. 53B HDL	*ND
7. 54B HDL	2 ppm, Aroclor 1254
8. 55B HDL	*ND
9. 56B HDL	*ND
10. 57B HDL	97 ppm, Aroclor 1260
11. 58B HDL	15 ppm, Aroclor 1260
12. 60B HDL	*ND
13. 61B HDL	*ND

*Non-Detectable is less than 2 ppm.

File # 8525-0817
EIS Inc
Page 2

Customer Identification	PCB Level
14. 59 HDL	24 ppm, Aroclor 1254 55 ppm, Aroclor 1260 79 ppm total
15. 62 HDL	26 ppm, Aroclor 1254 61 ppm, Aroclor 1260 87 ppm total
16. 63 HDL	214 ppm, Aroclor 1260
17. 64 HDL	225 ppm, Aroclor 1260
18. 65 HDL	24 ppm, Aroclor 1260
19. 66 HDL	*ND
20. 67 HDL	6 ppm, Aroclor 1260
21. 68 HDL	20 ppm, Aroclor 1254 23 ppm, Aroclor 1260 43 ppm total
22. 69 HDL	4 ppm, Aroclor 1254
23. 70 HDL	8 ppm, Aroclor 1260
24. 71 HDL	*ND
25. 72 HDL	4 ppm, Aroclor 1260
26. 73 HDL	*ND
27. 74 HDL	*ND
28. 75 HDL	*ND
29. 46 HDL	*ND
30. 47 HDL	*ND
31. 48 HDL	*ND

*Non-Detectable is less than 2 ppm.

PPM

Customer Identification	PCB Level
32. 49 HDL	*ND
33. 50 HDL	9 ppm, Aroclor 1254] wondridge

*Non-Detectable is less than 2 ppm.

August 17, 1990
Date

Ann L. Smrek /bg
ANN L. SMREK
Director of Laboratory Services

ALS:acd

APPENDIX E

DOCUMENTATION OF SEWAGE SLUDGE INJECTION

Injection of sewage sludge on landscape at WRF 1974

for Base Closure team

DAVID R. SHELTON
ATTORNEY AND COUNSELLOR AT LAW
MUNSEY BUILDING
WASHINGTON, D. C. 20004
NATIONAL 8-6808

July 18, 1977

Residence:
13905 Dawson Beach Road
Woodbridge, Virginia 22191

Mr. Glenn Chapman
Facility Engineer
Harry Diamond Laboratory
2800 Powder Mill Road
Adelphi, Maryland 20783

Re: Plan to inject daily 1,800 tons to 6,000 tons of wet sewage sludge from Blue Plains on Harry Diamond Army Reservation at Woodbridge

Dear Mr. Chapman:

At Mr. Kelecheck's request I am sending you the following:

1. Copy of my letter of November 20, 1974 to Col. Austin Lowery.

2. Copy of Col. David W. Einsel, Jr.'s reply to me dated December 4, 1974.

3. Copy of my letter of December 9, 1974 to Col. Einsel.

If there is anything further that I can do to make certain that the proposed desecration of the Belmont peninsula and its underground and surrounding waters with tons of Blue Plains sewage is not carried out please let me know.

Sincerely,

David R. Shelton

cc: Mr. George Kelecheck

DAVID R. SHELTON
ATTORNEY AND COUNSELLOR AT LAW
MUNSEY BUILDING
WASHINGTON, D. C. 20004

NATIONAL 8-6505

November 20, 1974

Colonel Austin Lowery
Harry Diamond Laboratories
Connecticut Avenue at Van Ness Street, N.W.
Washington, D.C.

Re: Injection of 20,000 gallons of sewage daily into underground water on Harry Diamond Laboratory property located on Belmont peninsula, Woodbridge, Va.

Dear Colonel Lowery:

This has reference to my telephone call to you on November 19, 1974 relating to the above matter. Today I have conferred with Mr. Kalecheck at the Harry Diamond Laboratory Woodbridge, Virginia, installation and he is actively cooperating in investigating the problem.

So there can be no misunderstanding, I want to point out that the Belmont peninsula on which my property is located, adjoining the Harry Diamond Laboratory property, is made up of an ancient swamp, with extensive impervious clay, and alluvial soil. The peninsula literally floats on a lake of water—not an underground stream—and has for many years been considered one of Prince William County's most valuable natural assets. Years ago it was seriously considered that this underground water supply on the Belmont peninsula would furnish adequate water to eastern Prince William County for the indefinite future and, of course, it is now a reserve supply in the event increasing water demands require its use.

The water table on the peninsula is extremely high, ranging from a few inches under the surface in low lying areas during the driest season to a few feet under the surface in the high areas during periods of rain. The 20,000 gallons of sewage now being injected daily into this lake of underground water will constitute a permanent pollution for ages to come because the sun and air have no chance for cleansing as would be the case if the sewage were dumped into the open water surrounding the peninsula.

Mr. Kelecheck had been misled into thinking that the nauseating stench that has recently permeated my property is in part attributable to odor from the distant celanese plant located 5 or 6 miles south of Fredericksburg, Virginia. I am fully familiar with the celanese plant and the Fredericksburg area and that plant has absolutely nothing to do with the stench that has covered my property for the first time in recent weeks. As I explained to Mr. Kelecheck today, the Fredericksburg celanese plant is located on the Rappahannock River more than 40 miles south of my property and is in no way connected with the odor permeating the Belmont area in the Potomac River valley.

To sum up: The Belmont peninsula is the most wholly unsuitable area for injection of sewage that could possibly be found in Prince William County. The needless and wanton destruction of the Belmont peninsula should be stopped immediately without another gallon of sewage going into the soil and underground water much less another 20,000 gallons daily. I would appreciate affirmative action and advice with respect thereto at your earliest opportunity.

For your convenience a copy of this letter is being sent to Mr. Kelecheck and the Environmental Protection Agency.

Very sincerely yours,

David R. Shelton

DEPARTMENT OF THE ARMY
HARRY DIAMOND LABORATORIES
WASHINGTON, D.C. 20438

COPY

4 DEC 1974

Mr. David R. Shelton
Attorney and Counsellor at Law
Munsey Building
Washington, D.C. 20004

Dear Mr. Shelton:

I have received your letter of 20 November to LTC Lowrey expressing concern about the sludege which was being injected into the soil at the Woodbridge Research Facility. As you have been informed by Mr. Kelecheck, we have stopped this program pending an analysis of the possible problem areas or detrimental side effects which it might present.

You have my assurance that it is neither our intent to temporarily or permanently pollute the water table of the Belmont peninsula, nor to cause conditions resulting in unfavorable odors in that area. On the contrary, the sludge injection program was implemented in an effort to improve the soil conditions and appearance at the Woodbridge site.

We will not reinstate the injection program at Woodbridge unless and until I am satisfied that doing so will not be detrimental to the ecology and safe living conditions of that area.

Sincerely yours,

DAVID W. EINSEL, Jr.
COL, CmlC, Commanding

DAVID R. SHELTON
ATTORNEY AND COUNSELLOR AT LAW
MUNSEY BUILDING
WASHINGTON, D. C. 20004

NATIONAL 8-6508

December 9, 1974

Col. David W. Einsel, Jr.
CmlC, Commanding
Department of the Army
Harry Diamond Laboratories
Washington, D.C. 20438

Re: Injection of sewage into Army Harry Diamond Laboratories property located on Belmont peninsula, Woodbridge, Va.

Dear Col. Einsel:

I have and thank you for your letter of December 4, 1974 relating to the above matter and note that you are considering the possibility of reinstating the sewage injection program on the Belmont peninsula at Woodbridge. Please let me know thirty days in advance in the event is is decided to reinstate this program so that I may have time to bring the Virginia State Water Control Commission into the matter and seek a court injunction together with damages.

I did not complain about the injection of this sewage without full knowledge of the basis for the complaint. I have made a careful geological study of the Belmont peninsula including geological charts issued with respect thereto and an extensive report prepared by the Federal Housing Administration in prohibiting the [illegible] of homes with basements over a major portion of the peninsula.

For your further information, an article that appeared in our local County newspaper, the Potomac News, under date of December 2, 1974, reads as follows:

"SEWERAGE DUMPING CHAPTER TWO

"It seems clear that the Army installation at Woodbridge has turned the base into a sewerage cesspool and also, will continue its annual deer slaughter. The OWSD is continuing its policy of injecting about 20,000 gallons of sewerage into the soil at Harry Diamond Lab.

"A spokesman for OWSD stated that if they

did not dump it on the Belmont peninsula it would require a trip of over 25 miles to get rid of it.

"The late Grover Manderfield often related how the area was tested as a potential emergency water supply for the area. He said Belmont was considered as the site for 6 to 8 wells from which the Sanitary District would draw its needs. When Belmont was new the only way VA would approve loans for the area was if the homes were built without basements due to the high water table, and even the homes in the newer sections which were built with basements are really more above ground than below.

"As the price of water goes up, and I am sure that everyone is now aware that Fairfax County is raising the price of water to our Sanitary District which means the cost will be passed on to the consumer, it would seem to me very important to protect such a potential vital water supply."

I have always regarded the Army as the best neighbor that anyone could possibly have. However, I must say that I was shocked to learn that this sewage injection program had been going on at the rate of 20,000 gallons a day since last September without a word to the several hundred homeowners on the peninsula. I was not apprised of what was going on until I asked one of the workmen operating a tank truck beside my property what he was doing and he told me that he was injecting sewage 18 inches deep so that it would go on down and not create an odor. He was utterly oblivious to the fact that this sewage was being put directly into the underground lake from which my drinking water comes and which is an extremely valuable resource as pointed out in the above newspaper article.

I trust that the source of your information as to the underground water conditions on the Belmont peninsula will be the same as mine so that there will be no further problem as to sewage injection.

Very sincerely yours,

s/ David R. Shelton

APPENDIX F

DOCUMENTATION OF THERMAL BATTERIES

DEPARTMENT OF THE ARMY
HEADQUARTERS, LABORATORY COMMAND
2800 POWDER MILL RD., ADELPHI, MARYLAND 20783-1145

REPLY TO
ATTENTION OF:

June 14, 1991

Haz. Matls. in Storage at WRF Thermal Batteries for Base Closure Team

Directorate of Risk Management

Commonwealth of Virginia
Department of Waste Management
Attn: Mr. Stuart T. Ashton IV
11th Floor, Monroe Building
101 N. 14th Street
Richmond, Virginia 22319

Dear Mr. Ashton:

Our letter of April 23, 1991, enclosed, identified a one-time need to dispose of approximately 8800 pounds of unused thermal batteries at the U.S. Army's Woodbridge Research Facility (WRF). These thermal batteries have been in storage for a number of years and are now obsolete. We have been unable to find a facility permitted to treat them and wish to inform you that, though we are diligently seeking a TSDF able to accept them, the batteries may remain at WRF longer than anticipated. The WRF (EPA ID VA0210000907) is generally considered a conditionally exempt small quantity generator, but is managing the batteries as a small quantity generator since the accumulated waste exceeds 1000 kg.

The batteries were intended to be used to activate fuze components in particular Army missiles and mortars. They are hermetically sealed containers weighing from one ounce to four pounds apiece and have the chemistry and composition as shown in the enclosure. Generally, the battery cells contain an electrolyte of lithium chloride and potassium chloride, a cathode of calcium chromate or potassium chromate, and an anode of solid calcium. In addition, all the batteries contain a pyrotechnic as a heat source and asbestos as an insulating material. The batteries can only be initiated if they receive the specific, designed input energy anticipated as part of the launch cycle of the munition into which they were designed to be assembled. The batteries contain no liquid and cannot leak. If a battery should somehow be initiated while in storage it should not be able to set off any other battery. For these reasons we feel they can continue to be safely stored in place while we continue our search for a solution.

Normal hazardous waste disposal operations for U.S. Army installations in northern Virginia are handled through the Defense Reutilization and Marketing Office (DRMO) located at Fort Belvoir.

Several months ago, our office received written assurance from the Fort Belvoir DRMO's regional headquarters that the hazardous waste contractor could effectively remove the thermal batteries should the Army determine them to be hazardous waste. On May 11, 1991 the batteries were classified as hazardous waste, and the DRMO regional headquarters promised they would be shipped off-site for treatment and disposal within 40 days.

On June 5, 1991, we received written notification from the DRMO regional office (see enclosure) that the hazardous waste contractor was unable to locate a disposal outlet for thermal batteries. According to the DRMO hazardous waste contractor, the asbestos material in the batteries prevents them from being incinerated at any approved disposal facilities in the country.

We continue to utilize every available resource in locating a viable disposal option for the stockpile of thermal batteries at the WRF. We hope to have the batteries off-site within the 270 days allowed by the regulations and will notify you of our progress, in writing, before January 6, 1992 (270 days after the batteries were declared waste). Please contact Mr. John Feustle or Mr. John Stowers at (301) 394-4511 if you or anyone on your staff wish to discuss this matter further. If we do not hear from you we will presume you do not disapprove of our plans.

Sincerely,

For Thomas E. Bower
Deputy Chief of Staff
for Risk Management

Enclosures

Copies Furnished:
U.S. Environmental Protection Agency, Region III, Attn: RCRA Permitting, 841 Chestnut Street, Philadelphia, PA 19107
Headquarters, U.S. Army Materiel Command, Attn: AMCEN-A (Mr. Gower), 5001 Eisenhower Avenue, Alexandria, VA 22333-0001

SLCIS-CC-AL, Tim Connolly
SLCIS-D, Teresa Kines
SLCIS-FE, Ray Roudebush
SLCHD-TA-EM, Jeff Nelson

DEPARTMENT OF THE ARMY
ADELPHI LABORATORY CENTER
2800 POWDER MILL RD., ADELPHI, MARYLAND 20783-1145

REPLY TO
ATTENTION OF:

April 23, 1991

Directorate of Risk Management

Commonwealth of Virginia
Department of Waste Management
ATTN: Mr. Stuart T. Ashton IV
11'th Floor, Monroe Building
101 N. 14'th Street
Richmond, Virginia 22319

Dear Mr. Ashton:

The U.S. Army Adelphi Laboratory Center has initiated documentation to dispose of approximately 8800 pounds of unused thermal batteries presently being stored at our Woodbridge Research Facility (WRF) in Woodbridge, Virginia. Because these batteries are capable of detonation or explosive decomposition if subjected to a strong initiating source or if heated under confinement, they are considered to be reactive.

The WRF facility is not a routine hazardous waste generator, however, a one time disposal of this large quantity of hazardous waste requires that the EPA Form 8700-12 (Notification of Hazardous Waste Activity) be amended (Enclosure).

Should you wish to discuss this matter further, please feel free to contact our environmental engineer, Mr. John Feustle, at (301) 394-4511.

Sincerely,

Thomas E. Bower
Deputy Chief of Staff
for Risk Management

Enclosure

COMMONWEALTH of VIRGINIA

DEPARTMENT OF WASTE MANAGEMENT
11th Floor, Monroe Building
101 N. 14th Street
Richmond, VA 23219
(804) 225-2667

APR 3 0 1991

Thomas E. Bower, DCS Risk Management
Department of the Army
Adelphi Laboratory Center
2800 Powder Mill RD
Adelphi, MD 20783-1145

Dear Sir:

I am writing to advise you that your Notification of Regulated Waste Activity (EPA Form 8700-12) was completed to indicate that Woodbridge Research Facility is a Treatment/Storage/Disposal Facility. You are reminded that the treatment/storage/disposal of hazardous waste is a permitted activity under the Virginia Hazardous Waste Management Regulations (VHWMR VR672-10-1). Your form is being returned without action for correction.

Additionally, the EPA form submitted to notify the Department of a subsequent change to your generator status has been superceded and is no longer accepted by the US EPA. A copy of the new Notification of Regulated Waste Activity is attached.

To obtain a permit to treat/store/dispose of hazardous waste you are required to apply under provisions of VHWMR. A copy of the regulations may be purchased by sending a request to the above address. The regulations contain both the application and fee schedule.

If you have any questions, please feel free to contact me directly at (804) 225-2867. Thank you.

Sincerely,

Stuart T. Ashton IV
Environmental Programs Analyst
Division of Technical Services

ENCLOSED THERMAL POWER SUPPLIES

PS #	No. of Boxes	No. of PS's	Lbs. per PS	Total wt of PS's	Electrochemical System Anode	Electrolyte	Cathode	Cell wt. per PS wt.	Total Weight of cells
113	20	8000	0.06	493 lbs.	Ca	LiCl-KCl	V2O5	6.8%	33.5 lbs.
119	1	63	0.27	17 lbs.	Ca	LiCl-KCl	WO3	2.4%	0.4 lbs.
201	5	375	0.27	102 lbs.	Az	CaCl-LiNO3	K2CrO4	8.1%	8.3 lbs.
					Mg	KCl-NaCl	K2CrO4		
204	19	605	0.29	176 lbs.	Mg	LiCl-KCl	V2O5	26.5%	46.6 lbs.
					Ca	LiBr-KBr	K2CrO4		
207	4	260	0.71	185 lbs.	Mg	LiCl-KCl	WO3	10.8%	20.0 lbs.
					Ca	LiBr-KBr	K2CrO4		
303	40	1146	1.41	1621 lbs.	Ca	LiBr-KBr	K2CrO4	10.4%	167.9 lbs.
403	74	1124	4.02	4518 lbs.	Ca	LiCl-KCl	CaCrO4	11.0%	495.2 lbs.
404	29	866	1.03	893 lbs.	Ca	LiCl-KCl	CaCrO4	5.3%	47.7 lbs.
405	14	548	1.34	733 lbs.	Ca	LiCl-KCl	CaCrO4	10.7%	78.5 lbs.
406	1	20	2.01	40 lbs.	Ca	LiCl-KCl	CaCrO4	6.6%	2.6 lbs.
Dragon	2	100	0.20	20 lbs.	Ca	LiCl-KCl	CaCrO4	10.0%	2.0 lbs.
BA628	2	100	0.49	49 lbs.	Ca	LiCl-KCl	CaCrO4	10.0%	4.9 lbs.

Total number of boxes 211

Total number of Power Supplies 13207

Total weight of Power Supplies 8847 lbs.

- Weight of can and metal structures 7100 lbs.
- Weight of insulation 440 lbs.
- Weight of pyrotechnic 400 lbs.
- Weight of cells 908 lbs.
  - lbs. of Ca 85 lbs.
  - lbs. of CaCrO4 189 lbs.
  - lbs. of V2O5 3 lbs.
  - lbs. of K2CrO4 60 lbs.
  - lbs. of WO3 2 lbs.
  - lbs. of Mg 2 lbs.
  - lbs. of electrolytes (salts) 293 lbs.
  - lbs. of cell structure materials 274 lbs.

DEFENSE LOGISTICS AGENCY
DEFENSE REUTILIZATION AND MARKETING SERVICE
DEFENSE REUTILIZATION AND MARKETING REGION COLUMBUS
926 TAYLOR STATION ROAD
BLACKLICK, OHIO 43004-9615

05 JUN 1991

IN REPLY REFER TO

DRMR-CHA (Mr. Jeffrey Hisey/(AV)850-3944)

SUBJECT: Removal of Thermal Batteries from Adelphi, MD

TO: U.S. Army Laboratory Command
Directorate of Risk Management
Adelphi. MD
ATTN: AMSLC-RK, Mr. John Fustele

1. This letter is to advise you that the hazardous waste contractor for Headquarters, Inst. Support Activity, Adelphi, MD is refusing to remove the thermal batteries currently being stored at Adelphi.

2. As the attached letters show, Enroserv Inc., the hazardous waste contractor for DRMO Belvoir, has submitted letters to this office from their disposal facilities indicating they are not permitted to handle thermal batteries due to the asbestos content.

3. There is currently no available outlet for disposal of these batteries. If a facility is located that is able to handle these batteries, Enroserv, Inc. will then be required to pickup and dispose of these items.

4. All questions should be directed to the undersigned.

G. JEFFREY HISEY
Contracting Officer

cc: DRMO Belvoir

2 Oct 90

SLCHD-TA-EM

MEMORANDUM for SLCIS-RK

Subject: Disposal of Excess Power Supplies.

1. There are two Transportainers at Woodbridge that are filled with boxes of antiquated thermal power supplies. Originally, these power supplies were stored as examples of the state-of-the-art of power supply production and as a backup to power supplies in the field. They were also useful as a barometer of the aging or deterioration of performance of power supplies when they are subjected to long term casual storage. Many of the power supplies were experimental or developmental. But now, these power supplies are obsolete and we wish to dispose of them.

2. Thermal power supplies contain chemicals, many of which are now considered hazardous or dangerous to good health. Before we can request that Risk Management dispose of these power supplies, we must identify the kinds and amounts of chemicals in them.

3. The accompanying table shows the model of power supply (the PS Number), the number of boxes containing the PS's, and, the weight of each PS model. The table identifies the electrochemical system used in the PS and gives a reasonable approximation of the weight percent of electrochemicals in the PS. Finally, the chart gives the total weight of electrochemicals built into the power supplies stored in the transportainers (908 lbs).

4. These power supplies also contain heat paper, a chemical heat source that is a mixture of approximately 28% zirconium, an oxidizing agent, and a filler/binder material. Finely particled zirconium, such as is used in heat paper, is considered hazardous because it is extremely sensitive to ignition. The oxidation reaction quickly produces lots of heat and very high temperatures. Heat activates the thermal power supply by melting the salt electrolyte and causing it to become conductive. To estimate the weight of heat paper chemicals in a power supply, we assume that the heat paper weighs 50% of what the electrochemical system weighs.

5. All thermal power supplies have built-in ignition systems to furnish the spark that ignites heat paper and activates the power supply. The ignition system is most often an electric match, but, may also be an inertial starter or a percussion primer. In either case, the systems contain an incendiary which is set off by a heated wire or by an abrasive or compressive force. There is only a very small amount of incendiary agent in the ignition systems, but, the systems should be considered hazardous because of their easy susceptibility to ignition.

6. These older power supplies also use some asbestos as insulating material. Asbestos is a carcinogen. Perhaps as much as 5% of the power supply weight is asbestos.

7. Thermal power supplies are hermetically sealed systems. Many of the chemicals used in thermal power supplies absorb moisture from air. To prevent absorption, power supplies are sealed in metal cans. When the power supply is activated, or, if the power supply is incinerated, the trapped air is heated and the internal pressure increases. Power supplies that are heated above the melting point of solder, or, heated to temperatures hot enough to self-activate may vent or explode.

Jeffrey T. Nelson
Chief SLCHD-TA-EM

§261.5 Special requirements for hazardous waste generated by conditionally exempt small quantity generators.

(a) A generator is a conditionally exempt small quantity generator in a calendar month if he generates no more than 100 kilograms of hazardous waste in that month.

(b) Except for those wastes identified in paragraphs (e), (f), (g), and (j) of this section, a conditionally exempt small quantity generator's hazardous wastes are not subject to regulation under Parts 262 through 266, 268 and Parts 270 and 124 of this chapter, and the notification requirements of Section 3010 of RCRA, provided the generator complies with the requirements of paragraphs (f), (g), and (j) of this section.

[Source Note: At 50 FR 28743, July 15, 1985, revised (b), effective July 15, 1985; and at 50 FR 49202, November 29, 1985, and 51 FR 40637, Nov. 7, 1986, revised (b).]

(c) Hazardous waste that is not subject to regulation or that is subject only to §262.11, §262.12, §262.40(c), and §262.41 is not included in the quantity determinations of this Part and Parts 262 through 266, 268 and 270 and is not subject to any of the requirements of those Parts. Hazardous waste that is subject to the requirements of §261.6(b) and (c) and Subparts C, D and F of Part 266 is included in the quantity determination of this Part and is subject to the requirements of Parts 262 through 266, 268 and 270.

[Source Note: At 50 FR 665, January 4, 1985, and at 50 FR 14219, April 11, 1985, and 51 FR 40637, Nov. 7, 1986, revised 261.5(c).]

(d) In determining the quantity of hazardous waste generated, a generator need not include:

(1) Hazardous waste when it is removed from on-site storage; or

(2) Hazardous waste produced by on-site treatment (including reclamation) of his hazardous waste, so long as the hazardous waste that is treated was counted once; or

(3) Spent materials that are generated, reclaimed, and subsequently reused on-site, so long as such spent materials have been counted once.

(e) If a generator generates acute hazardous waste in a calendar month in quantities greater than set forth below, all quantities of that acute hazardous waste are subject to full regulation under Parts 262 through 266, 268 and Parts 270 and 124 of this chapter, and the notification requirements of Section 3010 of RCRA:

(1) A total of one kilogram of acute hazardous wastes listed in §§261.31, 261.32, or 261.33(e).

(2) A total of 100 kilograms of any residue or contaminated soil, waste, or other debris resulting from the clean-up of a spill, into or on any land or water, of any acute hazardous wastes listed in §§261.31, 261.32, or 261.33(e).

[Comment: "Full regulation" means those regulations applicable to generators of greater than 1,000 kg of non-acutely hazardous waste in a calendar month.]

[Source Note: At 50 FR 1999, January 14, 1985, revised (e)(1) and (2); and at 51 FR 40637, Nov. 7, 1986, revised (e); and at 53 FR 27163, July 19, 1988, added Comment.]

(f) In order for acute hazardous wastes generated by a generator of acute hazardous wastes in quantities equal to or less than those set forth in paragraph (e)(1) or (e)(2) of this section to be excluded from full regulation under this section, the generator must comply with the following requirements:

(1) Section 262.11 of this chapter;

(2) The generator may accumulate acute hazardous waste on-site. If he accumulates at any time acute hazardous wastes in quantities greater than those set forth in paragraph (e)(1) or (e)(2) of this section, all of those accumulated wastes are subject to regulation under Parts 262 through 266, 268 and Parts 270 and 124 of this chapter, and the applicable notification requirements of section 3010 of RCRA. The time period of §262.34(d) of this chapter, for accumulation of wastes on-site, begins when the accumulated wastes exceed the applicable exclusion limit;

(3) A conditionally exempt small quantity generator may either treat or dispose of his acute hazardous waste in an on-site facility or ensure delivery to an off-site treatment, storage or disposal facility, either of which, if located in the U.S., is:

(i) Permitted under Part 270 of this chapter;

(ii) In interim status under Parts 270 and 265 of this chapter;

(iii) Authorized to manage hazardous waste by a State with a hazardous waste management program approved under Part 271 of this chapter;

(iv) Permitted, licensed, or registered by a State to manage municipal or industrial solid waste; or

(v) A facility which:

(A) Beneficially uses or reuses, or legitimately recycles or reclaims its waste; or

(B) Treats its waste prior to beneficial use or reuse, or legitimate recycling or reclamation.

(g) In order for hazardous waste generated by a conditionally exempt small quantity generator in quantities of less that 100 kilograms hazardous waste during a calendar month to be excluded from full regulation under this section, the generator must comply with the following requirements:

(1) Section 262.11 of this chapter;

(2) The conditionally exempt small quantity generator may accumulate hazardous waste on-site. If he accumulates at any time more than a total of 1000 kilograms of his hazardous wastes, all of those accumulated wastes are subject to regulation under the special provisions of Part 262 applicable to generators of between 100 kg and 1000 kg of hazardous waste in a calendar month, as well as the requirements of Parts 263 through 266, 268 and Parts 270 and 124 of this chapter, and the applicable notification requirements of section 3010 of RCRA. The time period of §262.34(d) for accumulation of wastes on-site begins for a conditionally exempt small quantity generator when the accumulated wastes exceed 1000 kilograms;

(3) A conditionally exempt small quantity generator may either treat or dispose of his hazardous waste in an on-site facility or ensure delivery to an off-site treatment, storage or disposal

SMALL QUANTITY GENERATORS

Under the RCRA Reauthorization Act, "Small Quantity Generators" (SQG's) generating between 100 kg and 1000 kg of hazardous waste per month are now subject to regulation. Final rules governing SQG's were promulgated March 24, 1986, and are in effect as of September 22, 1986. The standards for generators of between 100 kg and 1000 kg per month are identical to those for full size generators except:

1) 100-1000 kg generators may ship hazardous waste for reclamation without a manifest [40 CFR 262.20(e)].

2) 100-1000 kg generators may not accumulate waste on site in excess of 6000 kg. These generators may accumulate hazardous waste for up to 180 days or for 270 days if the waste must be shipped further than 200 miles for treatment, storage or disposal [40 CFR 262.34(d) and (d)(1)].

3) 100-1000 kg generators need not maintain a 50 foot buffer zone between the property boundary and containers accumulating ignitable or reactive waste [40 CFR 262.34(d)(2)].

4) 100-1000 kg generators, need only comply with the limited standards for accumulation of wastes in tanks found at 40 CFR 265.201.

5) 100-1000 kg generators are not required to document training in a formal training plan.

6) 100-1000 kg generators are subject only to reduced contingency planning rules [40 CFR 262.34(d)(4)].

7) 100-1000 kg generators are not required to submit biennial waste reports.

8) 100-1000 kg generators are not required to investigate manifests for which the "confirmation copy" was not received back from the TSDF. An "Exception Report" need not be submitted until 60 days after shipment and consists only of a legible copy of the manifest and an indication that confirmation of delivery was not received.

DEPARTMENT OF THE ARMY
ADELPHI LABORATORY CENTER
2800 POWDER MILL RD., ADELPHI, MARYLAND 20783-1145

REPLY TO
ATTENTION OF:

AMSLC-RK-E (200-1a) 17 September 1991

MEMORANDUM FOR Director, U.S. Army Harry Diamond Laboratories, ATTN: SLCHD-TA-EM (Dr. Nelson), 2800 Powder Mill Road, Adelphi, MD 20783-1197

SUBJECT: Disposal of WRF Thermal Batteries

1. Reference memorandum, SLCHD-TA-EM, 2 Oct 90, subject: Disposal of Excess Power Supplies (Enclosure).

2. Referenced memorandum identified 8847 pounds of obsolete power supplies at the Woodbridge Research Facility. The memorandum further indicated a desire to dispose of the power supplies.

3. On 22 Oct 90, our office requested assistance from the Fort Belvoir Defense Reutilization and Marketing Office (DRMO) to initiate procedures for disposing of the power supplies. When the Fort Belvoir DRMO hesitated to provide us disposal assistance, we wrote to the DRMO Regional Office in Columbus, Ohio, on 27 Nov 90, and requested their support in this matter.

4. On 15 Jan 91, the DRMO Regional Office in Columbus formally indicated that the DRMO at Fort Belvoir would assist us in disposing of the thermal power supplies. We were instructed to submit a properly completed Disposal Turn-In Document, DD Form 1348-1, to DRMO Belvoir and that the thermal power supplies would be gone within 40 days. Funds were identified by the Directorate of Risk Management (DRK), and a Disposal Turn-In Document was provided to the Fort Belvoir DRMO on 11 Mar 90.

5. After a minimal effort on the part of the Fort Belvoir DRMO and their hazardous waste contactor, Enroserv, Inc., we were notified on 5 Jun 91 by DRMO Columbus that there is, "currently no available outlet for disposal of these batteries," due to their chemical composition.

6. DRK contacted several other hazardous waste disposal contractors and located one, Chemical Waste Management, Inc., who was willing to take a hard look at disposal options for the thermal batteries. Chem Waste indicated they might be able to obtain a variance from the EPA to allow for a one-time disposal of the thermal power supplies. Chem Waste sent us waste profile sheets which we forwarded to you on 16 Jul 91 for completion. Before Chem Waste will know whether they can dispose of the batteries, a complete chemical profile of each type of thermal battery and a sample of each type of battery is needed.

AMSLC-RK-E
SUBJECT: Disposal of WRF Thermal Batteries

7. According to both EPA and State of Virginia regulations, the Installation owner/operator is legally required to file an application to operate a hazardous waste storage facility if the thermal batteries are not removed from WRF before 6 Jan 92. Time is running out! Please submit the completed profile sheets and battery samples to myself or Mr. John Feustle, ATTN: AMSLC-RK-E as soon as possible.

FOR THE COMMANDER:

THOMAS E. BOWER
Deputy Chief of Staff
for Risk Management

Encl

CF:
SLCHD-NW-E, Dr. Ingram
SLCHD-SD, Joe Miller

2 Oct 90

SLCHD-TA-EM

MEMORANDUM for SLCIS-RK

Subject: Disposal of Excess Power Supplies.

1. There are two Transportainers at Woodbridge that are filled with boxes of antiquated thermal power supplies. Originally, these power supplies were stored as examples of the state-of-the-art of power supply production and as a backup to power supplies in the field. They were also useful as a barometer of the aging or deterioration of performance of power supplies when they are subjected to long term casual storage. Many of the power supplies were experimental or developmental. But now, these power supplies are obsolete and we wish to dispose of them.

2. Thermal power supplies contain chemicals, many of which are now considered hazardous or dangerous to good health. Before we can request that Risk Management dispose of these power supplies, we must identify the kinds and amounts of chemicals in them.

3. The accompanying table shows the model of power supply (the PS Number), the number of boxes containing the PS's, and, the weight of each PS model. The table identifies the electrochemical system used in the PS and gives a reasonable approximation of the weight percent of electrochemicals in the PS. Finally, the chart gives the total weight of electrochemicals built into the power supplies stored in the transportainers (908 lbs).

4. These power supplies also contain heat paper, a chemical heat source that is a mixture of approximately 28% zirconium, an oxidizing agent, and a filler/binder material. Finely particled zirconium, such as is used in heat paper, is considered hazardous because it is extremely sensitive to ignition. The oxidation reaction quickly produces lots of heat and very high temperatures. Heat activates the thermal power supply by melting the salt electrolyte and causing it to become conductive. To estimate the weight of heat paper chemicals in a power supply, we assume that the heat paper weighs 50% of what the electrochemical system weighs.

5. All thermal power supplies have built-in ignition systems to furnish the spark that ignites heat paper and activates the power supply. The ignition system is most often an electric match, but, may also be an inertial starter or a percussion primer. In either case, the systems contain an incendiary which is set off by a heated wire or by an abrasive or compressive force. There is only a very small amount of incendiary agent in the ignition systems, but, the systems should be considered hazardous because of their easy susceptibility to ignition.

6. These older power supplies also use some asbestos as insulating material. Asbestos is a carcinogen. Perhaps as much as 5% of the power supply weight is asbestos.

7. Thermal power supplies are hermetically sealed systems. Many of the chemicals used in thermal power supplies absorb moisture from air. To prevent absorption, power supplies are sealed in metal cans. When the power supply is activated, or, if the power supply is incinerated, the trapped air is heated and the internal pressure increases. Power supplies that are heated above the melting point of solder, or, heated to temperatures hot enough to self-activate may vent or explode.

Jeffrey T. Nelson
Chief SLCHD-TA-EM

ACCESSED THERMAL POWER SUPPLIES

PS #	No. of Boxes	No. of PS's	Lbs. per PS	Total wt of PS's	Electrochemical System			Cell wt. per PS wt.	Total Weight of cells
					Anode	Electrolyte	Cathode		
113	20	8000	0.06	493 lbs.	Ca	LiCl-KCl	V2O5	6.8%	33.5 lbs.
119	1	63	0.27	17 lbs.	Ca	LiCl-KCl	WO3	2.4%	0.4 lbs.
201	5	375	0.27	102 lbs.	Ag	CaCl-LiNO3	K2CrO4	8.1%	8.3 lbs.
					Mg	KCl-NaCl	K2CrO4		
204	19	605	0.29	176 lbs.	Mg	LiCl-KCl	V2O5	26.5%	46.6 lbs.
					Ca	LiBr-KBr	K2CrO4		
207	4	260	0.71	185 lbs.	Mg	LiCl-KCl	WO3	10.8%	20.0 lbs.
					Ca	LiBr-KBr	K2CrO4		
303	40	1146	1.41	1621 lbs.	Ca	LiBr-KBr	K2CrO4	10.4%	167.9 lbs.
403	74	1124	4.02	4518 lbs.	Ca	LiCl-KCl	CaCrO4	11.0%	495.2 lbs.
404	29	866	1.03	893 lbs.	Ca	LiCl-KCl	CaCrO4	5.3%	47.7 lbs.
405	14	548	1.34	733 lbs.	Ca	LiCl-KCl	CaCrO4	10.7%	78.5 lbs.
406	1	20	2.01	40 lbs.	Ca	LiCl-KCl	CaCrO4	6.6%	2.6 lbs.
agon	2	100	0.20	20 lbs.	Ca	LiCl-KCl	CaCrO4	10.0%	2.0 lbs.
A628	2	100	0.49	49 lbs.	Ca	LiCl-KCl	CaCrO4	10.0%	4.9 lbs.

al number of boxes 211

al number of Power Supplies 13207

al weight of Power Supplies 8847 lbs.

- Weight of can and metal structures 7100 lbs.
- Weight of insulation 440 lbs.
- Weight of pyrotechnic 400 lbs.
- Weight of cells 908 lbs.
  - lbs. of Ca 85 lbs.
  - lbs. of CaCrO4 189 lbs.
  - lbs. of V2O5 3 lbs.
  - lbs. of K2CrO4 60 lbs.
  - lbs. of WO3 2 lbs.
  - lbs. of Mg 2 lbs.
  - lbs. of electrolytes (salts) 293 lbs.
  - lbs. of cell structure materials 274 lbs.

APPENDIX G

UNDERGROUND STORAGE TANKS INFORMATION

(Supplied By Facility)

WOODBRIDGE RESEARCH FACILITY

BUILDING 101, GUARDHOUSE

1,000 gallon #2 FO tank of steel construction and steel piping, with a reported installation date of 1966. This tank failed the leak test 7 Jan 91, and all product was then promptly removed. This tank is scheduled to be removed from the ground during CY91. Removed from the ground 11 Sep 91 (see MFR dated 11 Sep 91

EPA regulations exempt tanks storing heating oil used on the premises where it is stored.
Virginia Regulation 680-13-02 exempts heating oil tanks of capacity less than 5,000 gallons (p.8). AR 200-1 applies.

BUILDING 202

(1) 10,000 gallon #2 FO tank of steel construction with steel piping, removed from the ground June 1990 (leak test failure 17 Nov 89). Soil from the excavation was collected and analyzed for Total Petroleum Hydrocarbons (TPH) and found to contain <25 milligrams per liter.
Reported installation date was 1966.

(2) 10,000 gallon #2 FO tank of steel construction and steel piping, removed from the ground June 1990 (leak test failure 17 Nov 89). Soil from the excavation was analyzed for TPH (<25 mg/l). Reported installation date was 1966.

(3) 2,000 gallon diesel tank of fiberglass construction was reportedly installed in 1981 to replace a leaking 10,000 gallon steel tank. Not leak tested.

EPA regulations require leak detection to be installed on this tank NLT December 1993, corrosion protection NLT December 1998, and spill/overfill protection NLT December 1998.
VA regulations also require installation of approved leak detection and monthly inventory control NLT December 1993 and approved corrosion protection and spill and overfill prevention NLT December 1988.

for WRF
Base Closure

WRF BUILDING 202 (continued)

(4) 1,000 gallon gasoline tank of fiberglass construction with fiberglass piping. Installed in June 1990, and passed the Petro-Tite leak test 5 September 1990. Old tank, which was removed from the ground June 1990, failed the tightness test 8 Nov 89. Soil from the tank excavation was analyzed for TPH on 21 Mar 90 and determined to contain <25 mg/l. Two groundwater monitoring wells were also installed as was spill/overfill protection.

EPA regulations require monthly monitoring/inventory control. VA regulations require monthly monitoring for releases or monthly inventory control combined with tank tightness testing every five years. Leak test required NLT 5 September 1995.

WRF BUILDING 203

10,000 gallon #2 FO tank of steel construction and steel piping, passed the precision leak test 7 Jan 91. Reported installation date 1966.

EPA regulations exempt this heating oil tank. Virginia Regulation 680-13-02 requires Annual tightness testing until this tank is upgraded and monthly inventory control (Leak test required NLT 7 JAN 92). Effective December 1998, corrosion protection and spill/overfill prevention must be implemented.

BLDG 203

2,000 gallon #2 FO tank of steel construction was reportedly removed from the ground sometime around 1986/7 by Facilities Engineers. Reported installation date was 1966.

BUILDING 211

1,500 gallon #2 FO tank of steel construction and steel piping has not been tightness tested to date. Reported installation date was 1976.

EPA regulations exempt this heating oil tank. Virginia regulation exempts heating oil tanks having a capacity less than 5,000 gallons from the definition of UST. AR 200-1 requires that this tank be leak tested NLT December 1992 and every year thereafter until upgraded. Monthly monitoring/inventory control is also required.

WRF BUILDING 306

300 gallon #2 FO tank of steel construction and steel piping, has not been tightness tested. Reported installation date 1976.

EPA regulations exempt this heating oil tank. Virginia exempts this fuel oil tank from UST regulatory requirements. AR 200-1 requires this tank to be leak tested NLT December 1992 and every year thereafter until upgraded. Monthly monitoring/inventory control is also required.

WRF BUILDING 306

300 gallon diesel tank of steel construction and steel piping, has not been tightness tested. Reported installation date 1976.

EPA regulations require approved leak detection NLT December 1992 and monthly inventory control. Corrosion protection and spill and overfill prevention is required NLT December 1998. Virginia regulation recognizes manual tank gauging as a viable option for leak detection (p. 25) for tanks less than 550 gallon capacity.

WRF NOTE: Any upgrade to an existing UST, any removal, or any new installation at the WRF requires a permit from the Prince William County Fire Marshall's Office.

SLCIS-RK-E (200-1a) 11 September 1991

MEMORANDUM FOR THE RECORD

SUBJECT: UST Removal, WRF Building 101

1. A 1000 gallon fuel oil tank at the WRF guard office (Bldg. 101) failed a tightness test on 7 Jan 91. Facilities Engineers (FE) pumped the tank out. FE also assembled a contract to have the tank removed from the ground.

2. On 11 Sep 91, East Coast Industrial Co. removed the tank from the ground. Several of the pipes (vent, suction, and return) were corroded. Only one small hole was detected along the side of the tank, approximately 6-8" from the bottom. The strong presence of free product or vapors in the soils beneath the tank was detected. East Coast Industrial collected soil samples to be analyzed for TPH (Total Petroleum Hydrocarbons) and BTEX (Benzene, Toluene, Ethylbenzene, and Xylene).

3. The Prince William County Chief Mechanical Inspector is scheduled to visit the site of the tank excavation on 12 Sep 91.

4. I contacted the Commonwealth of Virginia, State Water Control Board to report the presence of soil vapors. I spoke with Mr. Albert Giles, Technical Services Supervisor, and asked for guidance in cleaning up contamination.

5. Mr. Giles had two main concerns; how badly the ground/groundwater is contaminated (ppm/ppb), how far the contamination extends. Soils must have <100 ppm TPH and <10 ppm BTEX. Groundwater must have <1 ppm TPH and <5 ppb benzene.

6. Mr. Giles stated that there are no time constraints for cleaning up the contamination, since this was a leak from a non-regulated UST. Mr. Giles said not to spend a lot of $ to reach the cleanup target. He is requiring that a "Site Characterization" and "Risk Assessment" be supported with data. The Virginia UST regulations outline steps in performing a site characterization and a risk assessment. Geological and hydrological data need to be included in the report. A site map also needs to be included.

7. Analytical soil sample results are expected to be available in one to two weeks. Additional analytical testing may also be required to dispose of the oil saturated soil (This will require another three or four weeks.). I believe that one or two truckloads of soil will have to be removed. I don't think we will need to install GW monitoring wells.

John F.

JOHN FEUSTLE

COUNTY OF PRINCE WILLIAM, VIRGINIA

MECHANICAL PERMIT

PERMIT-NO. 92-700857-M-00 DATE ISSUED - 91/09/06

THIS PERMIT IS ISSUED FOR CONSTRUCTION IN ACCORDANCE WITH PROVISIONS OF THE VIRGINIA UNIFORM STATEWIDE BUILDING CODE, ADOPTED BY THE BOARD OF SUPERVISORS OF PRINCE WILLIAM COUNTY, VIRGINIA.

THIS DOCUMENT IS REQUIRED TO BE POSTED AT THE CONSTRUCTION SITE FOR PUBLIC INSPECTION DURING THE ENTIRE TIME OF CONSTRUCTION AND UNTIL ALL WORK IS COMPLETED.

THIS PERMIT EXPIRES IN SIX MONTHS IF CONSTRUCTION HAS NOT BEGUN OR IF WORK IS SUSPENDED OR ABANDONED FOR SIX MONTHS.

*** NO INSPECTIONS WILL BE MADE UNLESS AN APPROVED SET OF PLANS IS ON THE JOB SITE.

OWNER U. S. GOVERMENT

PERMIT HOLDER EAST COAST

PREMISE ADDRESS 14013 DAWSON BEACH RD

SUBDIVISION SECTION

LANDBAY PHASE BLOCK LOT

MAP PAGE 22 MAP GRID J2

M

REMARKS: Building 101 Guardhouse

Removal of 1,000 gal F.O. 9-11-91

EROSION CONTROL DEVICES: ( ) INDIVIDUAL ( ) PERIMETER ( ) NONE
EROSION CONTROL DEVICES FOR LAND DISTURBED BUILDING ACTIVITY MUST BE MAINTAINED THROUGHOUT ENTIRE PERIOD OF CONSTRUCTION AS SHOWN ON APPROVED GRADING PLAN. IF AN INDIVIDUAL GRADING PLAN WAS NOT SUBMITTED FOR THE CONSTRUCTION UNDER THIS PERMIT, INDIVIDUAL EROSION CONTROLS FOR THIS LOT MAY STILL BE REQUIRED IF DETERMINATION IS MADE BY COUNTY INSPECTORS/ENGINEERS THAT EROSION/SEDIMENTATION IS NOT BEING PROPERLY CONTROLLED FOR THIS SITE.

Richard E. Lawson
BUILDING OFFICIAL

ISSUING AGENT

INSPECTION REQUESTS 792-6970

* NO INSPECTION REQUESTS WILL BE TAKEN WITHOUT A PERMIT NUMBER *

TO FACILITATE INSPECTIONS, YOU MUST HAVE THE PREMISE ADDRESS OR THE LOT NUMBER OF THE PROPERTY POSTED AND CLEARLY VISIBLE FROM THE STREET

Notification for Underground Storage Tanks

FORM APPROVED
OMB NO. 2050-0068
APPROVAL EXPIRES 6-30-88

VIRGINIA WATER CONTROL BOARD - UST PROGRAM
2111 NORTH HAMILTON STREET
RICHMOND, VIRGINIA 23230

STATE USE ONLY
I.D. Number

Date Received

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, or, in the absence of such records, your knowledge, belief, or recollection.

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means—

(a) in the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances; and

(b) in the case of any underground storage tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: 1. gasoline, used oil, or diesel fuel; and 2. industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:

1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. tanks used for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons;
6. storm water or waste water collection systems;
7. flow-through process tanks;
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Completed notification forms should be sent to the address given at the top of this page.

When To Notify? 1. Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. 2. Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use.

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. This form must by completed for each location containing underground storage tanks. If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached: 3

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
Commander, U.S. Army Laboratory Command

Street Address
ATTN: SLCIS-RK-E

County
2800 Powder Mill Road

City: Adelphi, State: Maryland ZIP Code: 20783-1145

Area Code: (202) Phone Number: 394-1784 or 4511

Type of Owner (Mark all that apply ☒)

- [X] Current
- [ ] Former
- [ ] State or Local Gov't
- [X] Federal Gov't (GSA facility I.D. no. 20981)
- [ ] Private or Corporate
- [ ] Ownership uncertain

II. LOCATION OF TANK(S)

(If same as Section I, mark box here ☐)

Facility Name or Company Site Identifier, as applicable
Woodbridge Research Facility

Street Address or State Road, as applicable
Dawson Beach Road

County
Prince William

City (nearest): Woodbridge, State: Virginia ZIP Code: 22193

Indicate number of tanks at this location: 7

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands ☐

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here ☐): Thomas E. Bower
Job Title: Deputy Chief of Staff for Risk Management
Area Code: (202) Phone Number: 394-3446

IV. TYPE OF NOTIFICATION

[X] Mark box here only if this is an amended or subsequent notification for this location.

V. CERTIFICATION (Read and sign after completing Section VI.)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

ENCL 2

Name and official title of owner or owner's authorized representative: THOMAS E. BOWER, Deputy Chief of Staff for Risk Mgmt
Signature:
Date Signed: March 15 1988

Section I) U.S. ARMY LAB COMMAND Location (from Section II) WOODBRIDGE VA Page No.

VI. DESCRIPTION OF UNDERGROUND STORAGE TANKS (Complete for each tank at this location.)

k Identification No. (e.g., ABC-123), or itrarily Assigned Sequential Number (e.g., 1,2,3...)	Tank No. 1 Bldg. 202	Tank No. 2 Bldg.202	Tank No.3 Bldg.203	Tank No.4 Bldg.211	Tank No.5 Bldg.101
tatus of Tank (Mark all that apply ☒)					
Currently in Use	☒	☐	☒	☒	☒
Temporarily Out of Use	☐	☐	☐	☐	☐
Permanently Out of Use	☐	☐	☐	☐	☐
Brought into Use after 5/8/86	☐	☒	☐	☐	☐
stimated Age (Years)	8	NEW 2/90	20	14	20
stimated Total Capacity (Gallons)	2000	1000	10,000	1500	1000
laterial of Construction (Mark one ☒)					
Steel	☐	☐	☒	☒	☒
Concrete	☐	☐	☐	☐	☐
Fiberglass Reinforced Plastic	☒	☒	☐	☐	☐
Unknown	☐	☐	☐	☐	☐
Other, Please Specify					
ıternal Protection (Mark all that apply ☒)					
Cathodic Protection	☐	☐	☐	☐	☐
Interior Lining (e.g., epoxy resins)	☐	☐	☐	☐	☐
None	☐	☐	☒	☒	☒
Unknown	☒	☐	☐	☐	☐
Other, Please Specify		double-wall fiberglass			
xternal Protection (Mark all that apply ☒)					
Cathodic Protection	☐	☐	☐	☐	☐
Painted (e g., asphaltic)	☐	☐	☐	☐	☐
Fiberglass Reinforced Plastic Coated	☒	☒	☐	☐	☐
None	☐	☐	☐	☐	☐
Unknown	☐	☐	☐	☐	☐
Other, Please Specify			asphalt coated	asphalt coated	asphalt coated
lping (Mark all that apply ☒)					
Bare Steel	☐	☐	☐	☐	☐
Galvanized Steel	☐	☐	☐	☐	☐
Fiberglass Reinforced Plastic	☐	☒	☐	☐	☐
Cathodically Protected	☐	☐	☐	☐	☐
Unknown	☐	☐	☐	☐	☐
Other, Please Specify	coated steel	fiberglass	coated steel	coated steel	coated steel
ubstance Currently or Last Stored Greatest Quantity by Volume (Mark all that apply ☒)					
a. Empty	☐	☒	☐	☐	☐
b. Petroleum					
Diesel	☒	☐	☐	☐	☐
Kerosene	☐	☐	☐	☐	☐
Gasoline (including alcohol blends)	☐	x	☐	☐	☐
Used Oil	☐	☐	☐	☐	☐
Other, Please Specify		not yet	No.2 FO	No. 2 FO	No.2 FO
c. Hazardous Substance	☐	☐	☐	☐	☐
ease Indicate Name of Principal CERCLA Substance		filled or			
OR					
Chemical Abstract Service (CAS) No.		tested			
Mark box ☒ if tank stores a mixture of substances	☐	☐	☐	☐	☐
d. Unknown	☐	☐	☐	☐	☐
dditional Information (for tanks permanently aken out of service)					
a. Estimated date last used (mo/yr)	/	/	/	/	/
Estimated quantity of substance remaining (gal.)					
c. Mark box ☒ if tank was filled with inert material (e.g., sand, concrete)	☐	☐	☐	☐	☐

VI. DESCRIPTION OF UNDERGROUND STORAGE TANKS (Complete for each tank at this location.)

cation No. (e.g., ABC-123), or Assigned Sequential Number (e.g., 1,2,3...)	Tank No6 Bldg. 306	Tank No. 7 Bldg. 306	Tank No. 8 Bldg. 202	Tank No. 9 Bldg. 202	Tank No.
tus of Tank (Mark all that apply ☒) — Currently in Use	X	X			
Temporarily Out of Use					
Permanently Out of Use			X	X	
Brought into Use after 5/8/86					
2. Estimated Age (Years)	14	14	40	40	
1. Estimated Total Capacity (Gallons)	300	300	10,000	10,000	
4. Material of Construction (Mark one ☒) — Steel	X	X	X	X	
Concrete					
Fiberglass Reinforced Plastic					
Unknown					
Other, Please Specify					
5. Internal Protection (Mark all that apply ☒) — Cathodic Protection					
Interior Lining (e.g., epoxy resins)					
None	X	X	X	X	
Unknown					
Other, Please Specify					
5. External Protection (Mark all that apply ☒) — Cathodic Protection					
Painted (e.g., asphaltic)	X	X			
Fiberglass Reinforced Plastic Coated					
None			X	X	
Unknown					
Other, Please Specify					
7. Piping (Mark all that apply ☒) — Bare Steel					
Galvanized Steel					
Fiberglass Reinforced Plastic					
Cathodically Protected					
Unknown			X	X	
Other, Please Specify	coated steel	coated steel			
8. Substance Currently or Last Stored in Greatest Quantity by Volume (Mark all that apply ☒) — a. Empty					
b. Petroleum					
Diesel	X				
Kerosene					
Gasoline (including alcohol blends)					
Used Oil					
Other, Please Specify		No. 2 FO	No. 2 FO	No. 2 FO	
c. Hazardous Substance					
Please Indicate Name of Principal CERCLA Substance					
OR Chemical Abstract Service (CAS) No.					
Mark box ☒ if tank stores a mixture of substances					
d. Unknown					
9. Additional Information (for tanks permanently taken out of service) a. Estimated date last used (mo/yr)	/	/	11 / 89	11 / 89	/
b. Known quantity of substance remaining (gal.)			0	0	
c. Mark box ☒ if tank was filled with inert material (e.g., sand, concrete)					

Tanks have been removed 2/90

VII. CERTIFICATION OF COMPLIANCE (COMPLETE FOR ALL NEW TANKS AT THIS LOCATION)

10. Installation (mark all that apply):

- ☐ The installer has been certified by the tank and piping manufacturers.
- ☒ The installer has been certified or licensed by the implementing agency.
- ☐ The installation has been inspected and certified by a registered professional engineer.
- ☒ The installation has been inspected and approved by the implementing agency.
- ☐ All work listed on the manufacturer's installation checklists has been completed.
- ☐ Another method was used as allowed by the implementing agency. Please specify:

  Installation of the 1000 gallon gasoline tank is not yet complete.

11. Release Detection (mark all that apply):

- ☒ Manual tank gauging.
- ☒ Tank tightness testing with inventory controls.
- ☒ Automatic tank gauging.
- ☐ Vapor monitoring.
- ☒ Ground-water monitoring.
- ☐ Interstitial monitoring within a secondary barrier.
- ☒ Interstitial monitoring within secondary containment.
- ☐ Automatic line leak detectors.
- ☒ Line tightness testing.
- ☐ Another method allowed by the implementing agency. Please specify:

12. Corrosion Protection (if applicable)

- ☐ As specified for coated steel tanks with cathodic protection.
- ☐ As specified for coated steel piping with cathodic protection.
- ☒ Another method allowed by the implementing agency. Please specify:

  Non-corrosive products used

13. I have financial responsibility in accordance with Subpart I. Please specify:

Method: Federal facility. N/A

Insurer: _____

Policy Number: _____

14. OATH: I certify that the information concerning installation provided in Item 10 is true to the best of my belief and knowledge.

Installer: _____ (Name) _____ (Date)

_____ (Position)

RPM Construction Co., Baltimore, MD &

Brisson Environmental Consultants, Inc. (Company)

Office of the Fire Marshal

HAZARDOUS INSTALLATION PERMIT

install equipment used in connection with the keeping, storage, use, manufacture, handling, transportation or other disposition of flammable, combustible, or explosive materials as stated below:

NO. 9479

24 hours as above 27 February 90 (date)

To whom it may concern:

By virtue of the provisions of the Fire Prevention Code of the County of Prince William, Virginia, Boisson Environmental 9906 Liberty Road Laurel Lotbury, M.d. , conducting a Environmental Business Contractor

having made application in due form, and as the conditions, surrounding, and arrangements are, in my opion opinion, such that the intent of the Code can be observed, authority is hereby given and this PERMIT is GRANTED for

OLDC 202

INSTALLATION of One 1,000 gallon and the removal of two 10,000 gallon & one 1,000 gallon underground flammable liquid storage tanks at Stone Diamond Lab, Dumfries Business Park

This PERMIT is issued and accepted on condition that all Code provisions now adopted, or that may hereafter be adopted, shall be complied with.

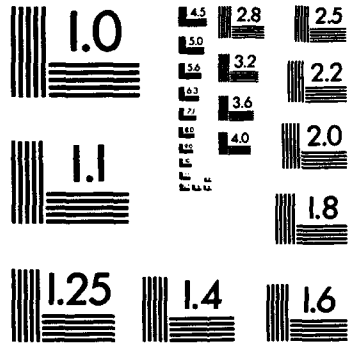
THIS PERMIT IS VALID ~~FOR~~ Until March 30 1990

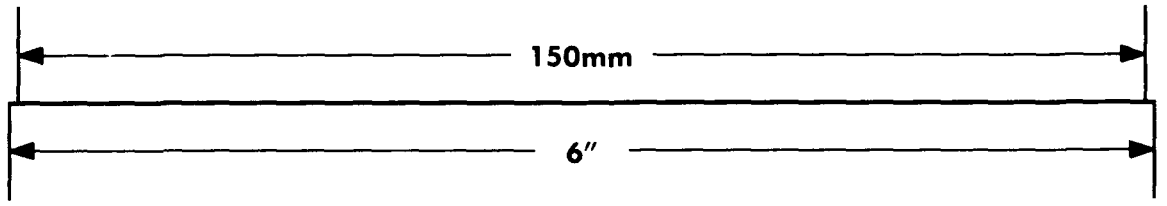
This permit does not take the place of any license required by law and is not transferable. The issuance of this Permit does not waive the necessity of obtaining a zoning permit, and/or special use permit or variance as required by local, state, or federal regulations and change in the use of occupancy of premises or change in location shall require a new permit.

John V. O'Neal
Chief Fire Marshal
CPT Scott
LT Weber

THIS PERMIT MUST AT ALL TIMES BE KEPT POSTED ON THE INSTALLATION SITE (after approval, a hazardous use permit will be required if not in effect at time of installation)

IMAGE EVALUATION
TEST TARGET (MT-3)





PHOTOGRAPHIC SCIENCES CORPORATION
770 BASKET ROAD
P.O. BOX 338
WEBSTER, NEW YORK 14580
(716) 265-1600

Data Chart for Tank System Tightness Test

petro tite
TANK TESTER

PRINT

OWNER Property ☐ Tank(s) ☐	Woodbridge Research Center — Name / Address / Representative / Telephone Dawson Beach Rd Woodbridge Va — Name / Address / Representative / Telephone
OPERATOR	Woodbridge Research Center — Name / Address / Telephone
REASON FOR TEST (Explain Fully)	New tank installation
WHO REQUESTED TEST AND WHEN	RPM — Name / Title / Company or Affiliation / Date Address / Telephone
WHO IS PAYING FOR THIS TEST?	RPM — Company, Agency or Individual / Person Authorizing / Title / Telephone Billing Address / City / State / Zip Attention of: / Order No. / Other Instructions

TANK(S) INVOLVED

Identify by Direction	Capacity	Brand/Supplier	Grade	Approx. Age	Steel/Fiberglass
Tank 1	1000		Gasoline	New	Fiberglass

INSTALLATION DATA

Location	Cover	Fills	Vents	Siphones	Pumps
South front of Plant	Concrete	2"	2"		Suction
North inside driveway, Rear of station, etc.	Concrete, Black Top, Earth, etc.	Size, Tight with, Drop tubes, Remote Fills	Size, Manifolded	Which tanks?	Suction, Remote Make & known

UNDERGROUND WATER

Depth to the Water table: N/A

Is the water over the tank? ☐ Yes ☑ No

FILL-UP ARRANGEMENTS

Tanks to be filled ______ by ______ Date ______ Arranged by ______ Name ______ Telephone

Extra product to "top off" and run TSTT. How and who to provide? Canadian NO Lead

Arrangement made by Owner

Terminal or other contact for notice or inquiry ______ Company ______ Name ______ Telephone

CONTRACTOR, MECHANICS, any other contractor involved

Petro Supply, Inc

OTHER INFORMATION OR REMARKS

Additional information on any items above. Officials or others to be advised when testing is in progress or completed. Visitors or observers present during test etc.

TEST RESULTS

Tests were made on the above tank systems in accordance with test procedures prescribed for petro tite as detailed on attached test charts with results as follows:

Tank Identification	Tight	Leakage Indicated	Date Tested
1000 Gal	50 x 150	Tight	9/5/89

CERTIFICATION

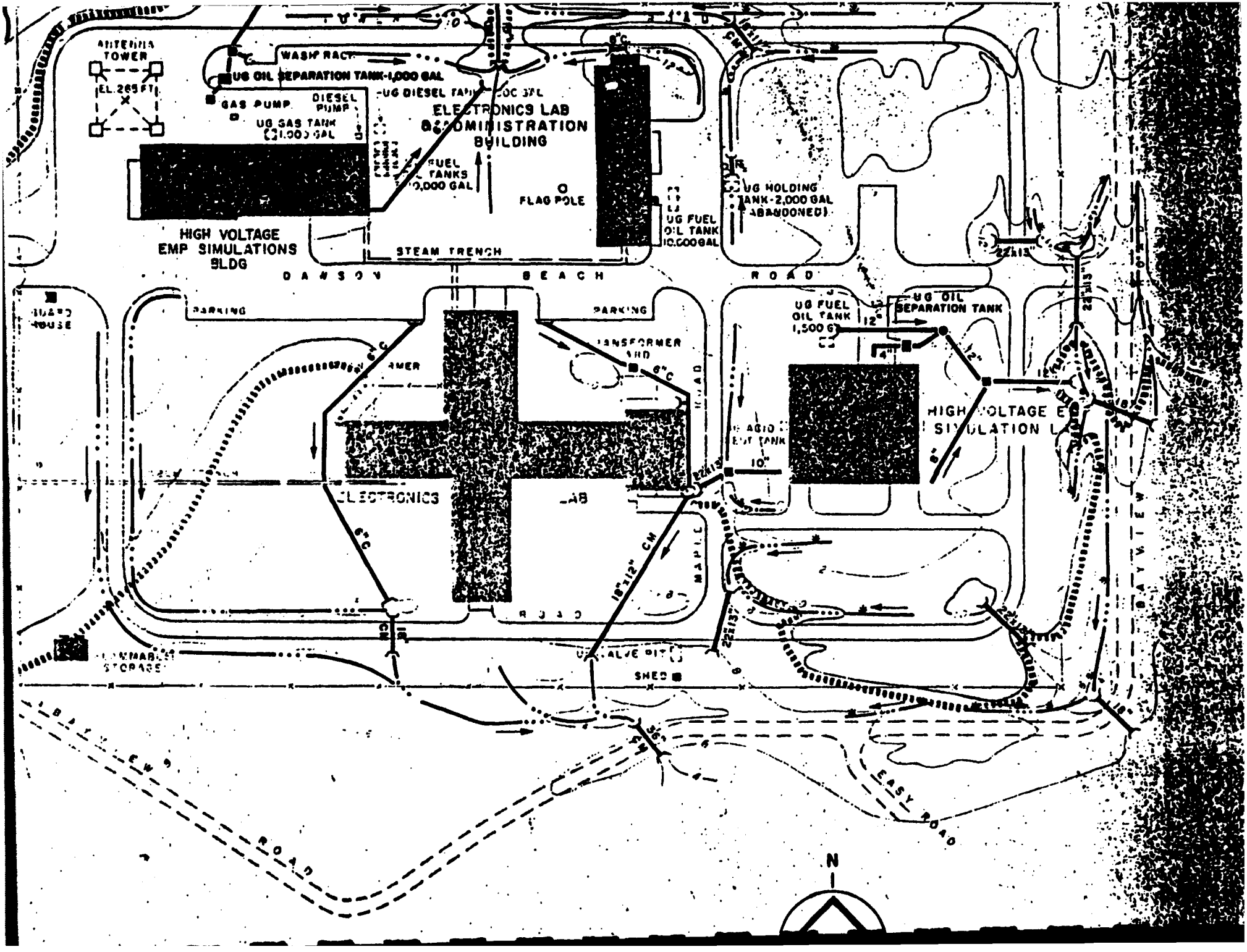
This is to certify that these tank systems were tested on the date(s) shown. Those indicated as "Tight" meet the criteria established by the National Fire Protection Association Pamphlet 329.

9/5/89 — Date

[signature] — Technician

Petro Supply, Inc. — Testing Contractor or Company — By: Signature

8677 Cherry Lane, Laurel, Md. 20707


ANTENNA TOWER
EL. 265 FT.
WASH RACK
UG OIL SEPARATION TANK-1,000 GAL
GAS PUMP
DIESEL PUMP
UG GAS TANK (1,000 GAL
UG DIESEL TANK
ELECTRONICS LAB & ADMINISTRATION BUILDING
FUEL OIL TANKS 10,000 GAL
FLAG POLE
UG HOLDING TANK-2,000 GAL (ABANDONED)
UG FUEL OIL TANK 10,000 GAL
HIGH VOLTAGE EMP SIMULATIONS BLDG
STEAM TRENCH
DAWSON BEACH ROAD
PARKING
PARKING
TRANSFORMER PAD
UG FUEL OIL TANK 1,500 G
UG OIL SEPARATION TANK
ACID WASTE TANK
10"
HIGH VOLTAGE EMP SIMULATION L
ELECTRONICS LAB
MAPLE ROAD
SHED
EASY ROAD
N

BALTIMORE NATIONAL PIKE
TE 40 WEST
IMORE, MD. 21228
17-3844

SEPARATION SCIENCE, INC.

"PS in Chromatography"

CERTIFICATE OF ANALYSIS
No. 900320-05
RPM Construction
March 21, 1990

Analysis of: Soil Samples
Project: Woodbridge Research Facility
Analyze for Total Petroleum Hydrocarbons (TPH)

	T.P.H.		
# 1	< 25	mg/kg	Bldg. 202 Gasoline tank excavation
# 2	< 25	mg/kg	Bldg. 202 Twin 10,000 gal F.O. tar excavation

The above analysis was performed according to procedures described in the following methods:
EPA 418.1: Petroleum Hydrocarbons, Total Recoverable
EPA 9071: Oil & Grease, Total Recoverable

Reviewed by: _____
Chemist

APPENDIX H

NAMES OF PAST AND PRESENT EMPLOYEES INTERVIEWED

APPENDIX H

NAMES OF PAST AND PRESENT EMPLOYEES INTERVIEWED

Allen, Harold. Maintenance Supervisor, Woodbridge Research Facility.

Booth, William. Facility Engineer, U.S. Army Laboratory Command at Adelphi, MD.

Brocklin, Allen. U.S. Geology Survey, Richmond (phone conversation).

Brower, Donald. Environmental Engineer, U.S. Army Laboratory Command at Adelphi, MD.

Burdick, Brett. Groundwater (VWCB), Personal (office).

Conover, John. Department of Waste Management, Richmond, VA (phone conversation and letter - no reply).

Cunningham, Lisa. EPA Federal Facilities (phone conversation).

Eckley, Ralph. Prince William County Service Authority, Director of Operations - Sludge Spreading (phone conversation).

Feustle, John. Installation Environmental Engineer, U.S. Army Laboratory Command at Adelphi, MD.

Greene, J.B. Groundwater (VWCB), Communication (documents).

Hanes, Marcus. Prince William County Environmental Health Department Sludge Injection - Possible Contaminants (phone conversation).

Hedding, Sue. Virginia Water Control Board (VWCB), Northern Virginia Office, NPDES and Spill Incident Data (phone conversation).

Hornig, Andrea. NPDES (VWCB), Office Visit (documents).

Hunley, Jessie. U.S. EPA, Facility Status WRT/RCRA (phone conversation).

Ingrams, John. Research Associate, Woodbridge Research Facility.

Kelway, John. Maintenance Worker, Woodbridge Research Facility.

Mane, Karen. Phone conversation about endangered species.

Mason, Kevin. Facilities Engineer, U.S. Army Laboratory Command at Adelphi, MD.

Mason, Kevin. Natural Resources Management Plan information (document).

Menzcer, Karen. Information on Critical Habitats: Beavers, Birds, Deer (phone conversation).

Mixon, Bob. U.S. Geological Survey, Reston, VA. Geology of Woodbridge Occoquan Quadrangle, Documents (personal office visit).

Nelms, David. Water Well Data (documents).

Patrick, Gene. Assistant to Director, Woodbridge Research Facility.

Reyser, Ron. Research Associate, Woodbridge Research Facility.

Rock, Stephen. Facilities Engineer, U.S. Army Laboratory Command at Adelphi, MD.

Schulz, Cindy. U.S. Fish and Game Commission.

Sinclair, Diane. Prince William County Soil Conservation District, Soils Map Compilation Assistance (phone conversation and letter documents).

Usher, Judith. Assistant to Director, Woodbridge Research Facility.

Ward, L.W. ("Buck"). Virginia Museum of Natural History Geological Information.

Wordwell, Bob. Adelphi LABCOM (phone conversation).

Wright, Jerry. Virginia Water Pollution Control Federation (phone conversation).